ZOE

A BIOLOGICAL JOURNAL.

PUBLISHED QUARTERLY.

VOL. IV. APRIL, 1893. No. 1.

CONTENTS:

	PAGE.
DR. ALBERT KELLOGG	1
Notes on some Colorado Plants: ALICE EASTWOOD	2
A new Trypetid from Mexico: C. H. TYLER TOWNSEND	13
Additions to the Flora of Colorado—II: ALICE EASTWOOD	16
Restricted Distribution of Oligochæta: GUSTAV EISEN	20
Contributions to Western Botany—No. 4: MARCUS E. JONES	22
Notes on the Food of Birds—I: WALTER E. BRYANT	54
The Hopkins Seaside Laboratory: O. P. JENKINS	58
The Botanical Writings of Edward L. Greene: KATHARINE BRANDEGEE	63
A New Subspecies of Ceroplastes from Mexico: T. D. A. COCKERELL	104
Recent Literature	106
Proceedings of Societies:	
California Academy of Sciences	110
California Botanical Club	111
California Zoological Club	111

SAN FRANCISCO:

ZOE PUBLISHING COMPANY,

P. O. BOX 2114.

Entered at the Post Office at San Francisco as Second-Class matter.

Yearly Subscription, $2.00
Single Copy, 75 cts.

Issued May 31, 1893.

ZOE

A BIOLOGICAL JOURNAL.

Published Quarterly by the

ZOE PUBLISHING COMPANY, San Francisco, Cal.

Subscriptions, $2.00 Per Year; Single Numbers, 75 Cents.

Foreign Countries in the Postal Union, 9 Shillings.

This price is invariable, no discount being made to dealers or agents.

☞Please remit by Postal Note or Money Order. Checks on local Banks not received.☜

EDITORS:

T. S. BRANDEGEE, WALTER E. BRYANT, DOUGLAS H. CAMPBELL,
ALICE EASTWOOD, CHARLES A. KEELER, FRANK H. VASLIT.

Volume i, pps. vi, 389, plate i-xii, vol. ii, pp. vi, 411, 6 plates, and vol. iii, pp. vi, 383, 7 plates, price, $2.00 each; may be obtained from the publishers.

D^r A Kellogg

ZOE

A BIOLOGICAL JOURNAL

VOL. IV. APRIL, 1893. No. 1.

DR. ALBERT KELLOGG.

The name of Kellogg is inseparably connected with the botany of California. Coming to this State in 1849, at the age of thirty-five, he lived for nearly forty years in the midst of a rich and varied flora. He published at various times during his residence, several genera, two hundred and fifteen species,* and several named varieties. The lapse of time and better knowledge have left valid less than sixty of these, but considering his isolation, lack of books and herbarium this proportion contrasts very favorably with the work in California of some botanical writers of much greater pretension. During the years 1877–1883 publication by the California Academy of Sciences ceased, and with the exception of a few which appeared in a San Francisco newspaper, the Rural Press, the species described by him thereafter remained in the herbarium of the California Academy of Sciences with the MS. diagnoses. Several of these, as *Eunanus angustatus*, *Sphæralcea fulva*, *Calyptridium nudum*, etc., have been described, either wholly or in part, from the types of Dr. Kellogg's unpublished species, and no mention made of his work.

He was one of a little band of seven who met at 129 Montgomery Street, in the office of L. W. Sloat, one of their number, on the fourth day of April, 1853, to found by the dim light of candles, which they had brought in their pockets, the California Academy of Sciences, now grown to proportions of which they could have hardly dreamed. When he died, March 31, 1887, he had long survived the rest.

* An annotated list of Dr. Kellogg's species is to be found in Bull. Cal. Acad., Vol. 1, pp. 128-151.

To the end of his life he was closely identified with the organization, which he loved with the love of a father. All visitors to the Society in the later years of his lifetime cannot fail to recall his familiar presence at the drawing-table in shirt-sleeves and red-backed vest, or, as in his hours of relaxation, leaning back in his chair with the stem of a cob pipe between his lips. He retained his sight marvelously, making to the last all his studies and drawings with a small hand lens, and finding any aid unnecessary to his reading and writing. His hair was just beginning to change from brown to gray when he died.

His personal character was above reproach; no one ever imputed to him falsehood or unfair dealing. His botanical statements, though sometimes erroneous, were true so far as he was concerned, and always made in good faith, but he was a dreamy, imaginative man, full of poetic fancies, which often in descriptions caused him to dwell unduly upon some point which caught his fancy. His habit of tracing "correspondencies" between the material world and its organisms and the mental states of man, often appeared in his botanical writings. The first description of "Marah," for instance, was followed by a small sermon on the "bitter waters" of affliction, and to the type of *Quercus Morehus* is appended the following note:

"Abram's Oak named from the circumstance of Abram's first encampment in the oak groves of Moreh, on his journey to Egypt (Egypt in correspondential language signifies Natural Sciences)."

His childlike enthusiasm and unworldliness impressed all who met him. He asked of the world only the means of simplest living. He lived a happy life and died respected. Would there were more like him.

NOTES ON SOME COLORADO PLANTS.

BY ALICE EASTWOOD.

RANUNCULUS ALISMÆFOLIUS Geyer. This is described in Coulter's Manual as having leaves with entire margins. This is misleading; for they are as often dentate with scattered teeth.

RANUNCULUS MACAULEYI Gray. This varies on every mountain range where it has been found. It grows along the edge of

snow banks, and the buds can often be seen under the thin crust of melting snow. The flowers vary from an inch or more in diameter to a half inch or less. In the San Juan Mountains, above Silverton, it is abundant along the edge of snow banks. The leaves are three-toothed at the truncate apex and entire below; the calyx is thickly covered with soft brown wool. Specimens from the Elk Mountains, above Irwin, have the petals usually entire, but occasionally flabelliform, leaves almost orbicular and crenate nearly to the base, the silky wool dense on the calyx. The form from the La Plata Mountains has the calyx either densely or sparingly hirsute; the root leaves oblong-lanceolate; stem leaves not cleft as in the other two forms.

RANUNCULUS GLABERRIMUS Hook. Specimens of this from Mancos have cauline leaves entire as well as deeply 2–3-lobed, akenes plainly hispid. I have found no plants with three large blunt teeth at the apex of the leaves.

DELPHINIUM OCCIDENTALE Watson. This varies greatly. At Steamboat Springs, in Routt County, it is one of the commonest plants; but rarely could two plants be found with flowers colored alike. They ranged from dark blue to white, and the forms between, where the two shades mingled, were mottled and striped, one part colored blue in one flower, white in another, so infinitely varied that to collect all forms was impossible. Usually it is found at subalpine elevations and is dark blue. I have specimens from above Irwin, in the Elk Mountains, in which all parts of the flower have become blue, bract-like petals.

AQUILEGIA ECALCARATA Eastwood. This has been collected in Southwestern Colorado in but one limited locality, about twenty-five miles from Mancos, near the head of Johnston Cañon that forms a branch of the Mancos Cañon. It was abundant under an overarching rock that even late in August was still wet with tne alkali water that oozed from it. The plants were growing in the sandy soil, loosely branching and also climbing up the rocky wall, apparently seeking moisture. The few flowers still in bloom were on stems that clung to the rock, but the plants were full of dry seed pods that indicated their earlier abundance. The pubescence is glandular and the flowers pink or white.

Mr. Alfred Wetherill, who discovered it, reports it also from Southeastern Utah in similar situations.

ARGEMONE. There seems to be doubt as to the existence of *Argemone hispida* Gray as a species, and in Colorado, if it has ever previously been collected, it has been merged into *Argemone platyceras* Link & Otto. It is excluded from both Patterson's and Oyster's check lists, but whether included under *A. platyceras* or *A. Mexicana* var. *albiflora* has not been learned. Judging from the specimens of *A. Mexicana* var. *albiflora* now in the herbarium of the California Academy of Sciences, *A. platyceras* is much nearer *A. Mexicana* var. *albiflora* than *A. hispida*. They are alike in the stem and foliage, glabrous and glaucous, except for the spines which are scattered on the stem and on the veins and margins of the leaves. The veins are also outlined with white, immature pods seem the same; the stamens differ slightly, *A. Mexicana* var. *albiflora* having broad filaments abruptly narrowed to the anther; *A. platyceras* with filaments narrower and tapering to the anthers which are longer and narrower than those of *A. Mexicana*. There is some variation in *A. platyceras* in the manner of branching, size of the pods, and number of spines. There are forms that closely resemble *A. corymbosa*, differing chiefly in having larger pods and the leaves longer, with deeper lobes and blunter at the apex.

Argemone hispida Gray. This is distinct from both *A. Mexicana* var. *albiflora* and *A. platyceras*, and shows so little variation that specimens from Colorado and California have no appreciable difference and agree with the original description as given in Gray's Plantæ Fendlerianæ. It differs most noticeably from the other two in the pale green foliage densely covered with short crimped bristles, short spines on the margins and veins of the leaves and very dense on the stems. The pod is densely covered with slender bristles of varying length, instead of the coarse, horn-like spines peculiar to the pod of *A. platyceras*. In growth *A. hispida* is more compact and the flowers are on short peduncles seeming almost sessile. The seeds of *A. platyceras* have a light-colored, pominent rhaphe and the coat honey-combed. *A. hispida* has the less prominent rhaphe of the same color as

the coat, which is less deeply pitted; the seeds are larger. The pods of *A. hispida* are ovate, and when they dehisce the segments are acuminate. In *A. platyceras* the pods are veiny and the segments acute. I have seen no intermediate forms which might connect these two that seem so different.

ERYSIMUM ASPERUM DC. This widely distributed species, as found on the plains, is low and stout, with pods often four inches long, numerous and perpendicular to the stem. The pods are stiff, and, projecting as they do, remind one of the spears of a Macedonian phalanx. The flowers are yellow. The variety at Silverton, in the San Juan Mountains, has the color of the flowers from pale yellow, almost white, to orange on the one hand, and through shades of pink and crimson to purple on the other. These different shades were found in one patch and seemed to indicate that the common yellow form had become mixed with a purple variety. The mountain form is more slender than the prairie plant, and the pods are ascending.

ARABIS HOLBŒLLII Hornem. This is one of the most puzzling of the western Cruciferæ because of its great variety of forms. If there are any plants of *A. Holbœllii* with one row of seeds in each cell, wherein does it differ from *A. canescens*, which also has stellate pubescence and deflexed pods? The division, if *A. canescens* is a good species, should be thus: Pods deflexed or spreading, seeds in one row, *A. canescens;* seeds in two rows, *A. Holbœllii*. If pods containing both one and two rows of seeds are found on the same plant of *A. Holbœllii*, then *A. canescens* ought to be included under *A. Holbœllii*. Including under *A. Holbœllii* all the forms that are perennial and have pods deflexed or spreading, with two rows of seeds in each cell and pubescence generally stellate, the following forms should be described in order to make the species better understood:

1. From Mancos, Colo. Stem simple, stout, tall, thickly clothed at base with white branching hairs, but not stellate, above glabrous and glaucous; radical leaves from spatulate to oblanceolate, sparingly dentate or entire; cauline leaves sagittate-clasping, pedicels spreading upwards and outwards, pods deflexed or horizontal, glabrous; winged seeds, two rows in each cell, petals twice as long as the stamens, erect.

2. From Mancos. Similar to No. 1, but canescent with close stellate pubescence; pedicels strictly deflexed with scattered stellate hairs, pods sparingly hairy along the margins. This was also collected in Navajo Cañon, a branch of Mancos Cañon.

3. From Mancos. Stems slender, several from the root, canescent with close stellate pubescence; radical leaves from spatulate-dentate to oblanceolate, entire; upper part of the stem and pods smooth and glossy, pods on spreading pedicels, two rows of winged seeds in each cell, flowers small.

4. From Mancos. Similar to No. 2. except that the cauline leaves are oblanceolate, sessile at the lower part of the stem, and sagittate above only.

5. From Southeastern Utah. This branches at the root and also above, and is chiefly distinguished by the short spreading pods not more than an inch in length.

6. From Central City, Colo. This branches from near the base with many slender stems, small lanceolate sessile leaves, with scattered bristly hairs on the margins.

ARENARIA FENDLERI Gray. This is found at Grand Junction with short leaves and straw-colored flowers.

SIDALCEA. This is described as having beakless carpels. The two species found in Colorado, *S. candida* and *S. malvæflora*, have carpels decidedly beaked, wrinkled, and veiny.

SPHÆRALCEA RIVULARIS Torr. This has been collected with two well marked forms. The plant seen in the Uncompahgre Cañon, near Ouray, was almost a bush three feet or more tall, with many leafy stems from the root, lower leaves a foot long, slightly lobed and crenate, hispid with stellate bristles, upper stem-leaves with deeper lobes irregularly toothed; flowers nearly two inches in diameter, white and few among the large, broad leaves which thickly clothe the stem.

At Steamboat Springs, in Routt County, Colo., *Sphæralcea rivularis* is abundant on a mountain side not far from the town. This variety branches into many flowering erect stems, leaves not more than three inches long, deeply lobed into acuminate divisions which are sharply dentate or laciniate, the large rose-colored or white flowers are crowded along the almost naked peduncles.

OXALIS CORNICULATA L. var STRICTA. The common form found at Denver is slender, loosely branching upwards, leaves scattered; the alpine variety shows a modification due to environment, and becomes low and almost prostrate, leaves crowded along the short rather stout stems.

PACHYSTINA MYRSINITES Raf. This is described in Coulter's Manual as having green flowers. All that I have seen have purple flowers.

MENTZELIA ALBICAULIS Dougl. There are two varieties of this common species. One is the widely distributed form with slender stems and linear-lanceolate leaves pinnatifid into narrow, linear lobes. The other which I name var. INTEGRIFOLIA is low with short, stout branches, or in more favorable situations becoming a foot high, leaves ovate-lanceolate or even broadly ovate entire or rarely coarsely and remotely dentate, petals not exceeding the stamens, pubescence somewhat viscid as well as barbed. This grows on the adobe desert and blooms almost as soon as it is up. It branches from near the base, and the leaves seem long and crowded on the short stems; but on the older specimens the stems elongate and the leaves are less crowded.

MENTZELIA MULTIFLORA Gray. At Grand Junction this variable species was found growing on a slaty hillside. It branched diffusely from the base and above, making a globular plant like a tumble weed. The stems are white, slender and sinuous; leaves small, about an inch long and pinnately parted into narrow, linear divisions; flowers small, not an inch in diameter, yellow. Along the McElmo Creek the plants have lobed leaves from one to three inches long, stems less numerous, stouter and straighter than the preceding, flowers larger.

MENTZELIA NUDA Torr. & Gray. This varies in the manner of growth and size of the flowers. The Denver form is loosely branched from near the base upwards, and the flowers are large, from one and one-half to two inches in diameter, distinctly pedunculate. The form from Southwestern Colorado has an erect stem simple up to the inflorescence; the branches are usually short with the almost sessile flowers bunched at the ends; flowers about an inch in diameter.

ANGELICA WHEELERI Watson. This is quite common in Colorado, at middle elevations along streams. Specimens have been collected at Crested Butte, Colorado Springs, Chiann Cañon, and at Central City.

APLOPAPPUS SPINULOSUS DC. and A. GRACILIS Gray occur through Southwestern Colorado, and there seem to be intermediate forms connecting the two. *A. spinulosus* is exceedingly variable, and the forms might easily be mistaken for new species in different localities.

ACTINELLA RICHARDSONII Nutt. This was collected by Miss Alida P. Lansing, in South Park, agreeing with the description of the type and different from the form var. *floribunda* common in Colorado. It has a few large heads, and the stems are shorter and stouter, while the variety has a cyme of many small flowers, and leaves in almost filiform divisions.

ACTINELLA GRANDIFLORA Torr. & Gray. This has the involucre from densely white woolly to almost glabrous, heads from one to three inches in diameter, leaves occasionally simple and linear, more frequently few to several lobed. Stems leafy or nearly naked and scape-like.

CNICUS ERIOCEPHALUS Gray. A few plants collected on Mt. Hesperus, of the La Plata Range, in Southwestern Colorado, seem to approach *C. Parryi* so closely that it is uncertain under which species to place the plants. The foliage is nearly glabrous, the involucral bracts have no lacerate fimbriate tips, the woolly hairs on the bracts are not dense, the flowers are light pink and in an erect glomerule.

CNICUS DRUMMONDII Gray var. BIPINNATUS n. var. This is either a variety of *C. Drummondii* or a new species. At present it seems better to consider it in the former light, and give the characters which distinguish it from the type of the species. Stems several from the root, two feet or more high, sparingly tomentose along the stem and the margins of the leaves; leaves divided into many linear lanceolate divisions that are themselves parted into similar lobes of variable length, the lower lobes often as long as the leaflet; the lobes are linear and about one-fourth inch

wide, one to three inches long; heads small and narrowly oblong; lower bracts of the involucre with weak prickles, upper ones purplish, acuminate and tipped with a weak point, scarious; flowers much exserted, heads several at the ends of the leafy, spreading branches.

FRAXINUS ANOMALA Torr. In this queer ash the leaves are nearly always simple and entire, the three-lobed or divided ones being rare. It is found at Grand Junction and on Mesa Verde, in Colorado, and through Southeastern Utah.

PHACELIA SPLENDENS n. sp. Annual, erect, about a foot high, usually simple stemmed, sometimes branching from near the base; stems purplish, glandular or glabrous; leaves ovate-lanceolate in outline, pinnately parted into three or four pairs of alternate divisions that are either crenate or bluntly lobed and oblique at base, nearly glabrous, but glandular on the rhachis; scorpioid cyme with a long naked peduncle; flowers on short pedicels; calyx white-hirsute, and slightly glandular, divisions linear-lanceolate, 1 mm. wide, 4 to 6 mm. long, veiny in age, with longitudinal nerves, slightly surpassing the ripe capsule; corolla bright blue, rarely white, about 1 cm. in diameter, divisions obtuse; stamens and style conspicuously exserted, 7 or 8 mm. beyond the corolla; capsule veiny, glandular, and hirsute; seeds with the central ridge very prominent, cymbiform, favose over the whole surface, but not corrugated. This beautiful Phacelia belongs to the Euphacelia, near. *P. glandulosa* and *P. Neo-Mexicana*. It grows on the adobe desert soil, and while not along the edges of irrigating ditches or washes, it was comparatively near by.

Collected at Grand Junction, May, 1892.

PENTSTEMON MOFFATII n. sp. Stems several from the root from one to two feet high, erect, scabrous below, glandular hirsute above; radical leaves crowded, ovate-spatulate, entire, decurrent along the petioles which equal or surpass the blade in length; lower cauline leaves spatulate with long, broad petioles which are connate-clasping; upper, ovate-lanceolate, closely sessile by a cordate base obscurely dentate at the apex or entire; thyrsus interrupted, the many-flowered clusters about an inch apart;

calyx of linear-lanceolate divisions hirsute, glandular, and ciliate with crimped hairs; corolla purplish blue, hardly bilabiate, spreading lobes orbicular; two of the stamens inserted at the base, the other two half way up the limb, nearly on a line with the sterile filament which is moderately bearded down the side with hairs pointing downwards. In the descriptions of Penstemons no attention has been paid to the insertion of the filaments which may prove of use in determining species that seem closely related. This belongs to the Genuini and is nearest *P. albidus* of which it may prove to be a variety. It differs from *P. albidus* in being less glandular, the shape and attachment of the leaves, the more interrupted inflorescence, the color and shape of the corolla, the denser beard of the sterile filament and in the explanate anthers which in *P. albidus* are orbicular and in *P. Moffatii*, oblong. It was collected at Grand Junction along the railroad to the coal beds, and I have named it in honor of David H. Moffat, ex-President of the D. & R. G. R. R., whose courtesy and kindness I wish to acknowledge.

ABRONIA TURBINATA Watson. This varies in the fruit, the wings in some specimens being well developed; in others, more or less aborted.

ATRIPLEX CORRUGATA Watson. This was collected at Grand Junction, in May, 1892, with both monœcious and diœcious plants. The plants collected the previous season from which the description was made were all diœcious.

ERIOGONUM BREVICAULE Nutt. This is the plant which Nuttall named *E. campanulatum*, but which with *E. micranthum* Nutt. Dr. Gray reduced to *E. brevicaule*. He says that these three species are not permanently distinguishable even as varieties. The descriptions omit the most striking feature of the flower, the urn-shaped perianth, constricted at the throat and angled along the sides. All the flowers examined on the Grand Junction plants have perfect flowers.

ERIOGONUM GLANDULOSUM Nutt. This has been but rarely collected, and the description is imperfect. My specimens agree with Nuttall's description of *Oxytheca glandulosa* under which

name it was first described. The following characteristics not given in Nuttall's description, seem worthy of note: The bracts within the involucre which in Eriogona generally are so small as to be seldom noticed, in this species are larger than the teeth of the involucre, which therefore seems to be double; the capillary branchlets are geniculate about the middle, usually bending towards their axis. It is rare at Grand Junction, but was common on a hill-side in Montezuma Cañon in Southeastern Utah.

ERIOGONUM SALSUGINOSUM Hook. There are two forms of this that are strikingly unlike, but specimens with peculiarities of both are to be found on the same plant. One has the involucre sessile in the axils of the leaves or the forks of the stem and appears close and compact; the other has the heads at the ends of hair-like peduncles of from one to three inches long; the sessile heads are often found as well as the long pedunculate ones on these specimens which usually have narrower leaves than the first form. The pedicels are generaily purple and often the whole plant has the same color. Found at Grand Junction and along McElmo Creek, in Colorado. It also grew on rocky, rounded hills in company with *E. glandulosum* and *E. divaricatum*, in Montezuma Cañon, in Southeastern Utah.

ERIOGONUM MICROTHECUM Nutt. The varieties of this species are puzzling, for it seems hard to know where and how to draw the line between it and *E. corymbosum* Benth. The flowers of the two species and their varieties differ so little as to furnish obscure distinguishing marks. The chief marks of difference are in the manner of growth and flowering. It seems best to arrange them in this way until more material can be obtained.

The type and the variety *effusum* have been sufficiently described; but there is a variety on the mesas at Durango, which seems to be undescribed. I propose to name it var. RIGIDUM because of its stiff manner of branching and flowering. Stems woody, one to two feet tall, branching from the base and also above, with erect branches tomentose throughout; leaves narrow, linear, revolute, numerous along the stem, about 2 cm. long;

corymbs umbel-like, small and compact on naked peduncles from 2 to 8 cm. long; the branchlets are usually perpendicular to the axis and the involucres are sessile, perpendicular, erect, and secund on the upper side.

ERIOGONUM CORYMBOSUM Benth. Leaves from narrowly linear 5 mm. wide to oblong 2 cm. wide, crenate-undulate on the margins and densely white-tomentose on the under surface. The leaves are either clustered near the root or are along the stem to the long, naked peduncle of the corymb, which is usually spreading but sometimes almost capitate. The stems, branches, and branchlets are densely tomentose and seem coarse compared with the var. *leptophyllum*. This variety has long, linear-lanceolate leaves with revolute margins, somewhat tomentose below, almost glabrous above, corymbs on naked peduncles, barely surpassing the leaves, loosely branched, sparingly flowered. The species is usually found on slaty hill-sides, while the variety is found in loose soil under the piñons and cedars or along the banks of dry alkali streams. It is uncertain whether the variety belongs to *E. corymbosum* or to *E. microthecum*.

SMILACINA STELLATA Desf. This is described as having blue-black berries. All that have been seen in Colorado, from observations extending over several years, have the berries at first green, striped with red, but when fully ripe they are red all over. The species in California has been collected with the red-striped berries. Doubtless, if collected or observed later in the season, the berries would be found as in Colorado.

FRITILLARIA ATROPURPUREA Nutt. This was collected at Mancos with both perfect and staminate flowers, showing a tendency to become diœcious. No pistillate flowers were found.

CALOCHORTUS NUTTALLII Torr & Gray. This usually has white petals, but at Grand Junction it varies through all the shades of pink to crimson-purple and also white. *C. Gunnisoni* shades through the blue shades to the bluish-purple and white.

A NEW TRYPETID FROM CHACALTIANGUIS, MEXICO, WITH A NOTE ON HEXACHÆTA AMABILIS LW.

BY C. H. TYLER TOWNSEND.

The following trypetid was collected by the writer, December 31, 1892, at Chacaltianguis, a river town about seventy-two Mexican miles up the Papaloapam River from Tlacotalpam. It was taken with other diptera and various insects, by sweeping the undergrowth in the edge of the woods back of the town.

This trypetid belongs, by the markings of its wings, in the genus Euaresta. It has four bristles on the scutellum, which does not, however, preclude it from this genus, as some of the species placed here by Loew also possess four scutellar bristles. But the shape of the wings is distinctly different from that of the wings of Euaresta. They are very broad on the median one-half of their length, then slightly taper to a blunt apex. I shall leave the form for the present, however, in Euaresta. The species is very similar to *E. Mexicana* Wd. and *E. melanogastra* Lw. (syn. of preceding ?) but differs from both in having four bristles on the scutellum; and it also differs from all the species of Euaresta in another character which must be mentioned, and which was considered by Loew of generic importance, that of the third longitudinal vein being bristly almost to its termination.

EUARESTA LATIPENNIS nov. sp. ♀.

Front more than one-third width of head posteriorly, evenly narrowed to about one-third width of head at base of antennæ, pale silvery on borders, the rest being taken up with the wide, very dilute tawny frontal vitta, which also has a silvery reflection. Antennæ very dilute tawny, third joint about one and one-half times as long as second, second joint with a small bristle anteriorly and sparsely clothed with minute bristles; arista thickened basally, where it is concolorous with antennæ, and shows a basal joint, blackish on remaining portion. Eyes (in dry specimen) dark green, or dull purple, according to change of light. Frontal bristles five in number on each side, not including the long posteriorly directed pair on vertex; of these the anterior

three on each side are nearly straight and directed forward, while the hinder two are curved and directed backward. A pair of curved, divergent, anteriorly directed ocellar bristles. Face and palpi pale silvery, the palpi sparsely clothed with small bristles on lower portion; cheeks, occiput, and proboscis dilute tawny, occiput above bordered with a row of whitish bristles. Thorax slightly silvery cinereous, with three golden brown vittæ, clothed with whitish bristles and hairs; humeri and pleuræ concolorous; scutellum nearly concolorous, rather triangular in shape, with four bristles, the anterior pair longest, the apical pair hardly decussate. Abdomen brownish, flattened, curved under, somewhat ovate in outline, rather pointed behind, quite sparsely clothed with short bristly hairs, and with longer bristles on hind margins of segments. Legs pale brownish fulvous, claws short and blackish. Wings broad, rather long, from apical three-fourth tapering almost equally on anterior and posterior borders to a blunt apex. Picture of wings almost the same as that of *E. Mexicana*, figured by Loew in Monographs, iii, pl. x, fig. 28. Differs from the figure only as follows: Second vein ends about in middle of margin of hyaline spot third from tip on anterior border; of the three marginal hyaline spots of second posterior cell, the two end ones are somewhat elongated inward like the middle one; the proximal one of the two costal hyaline markings in marginal cell does not extend inward below the second longitudinal vein, or is represented by only the merest dot, and the distal one does not quite reach second vein; one (the right) wing shows two hyaline drops about middle of discal cell, the distal one smaller, while in the other wing the smaller distal drop is represented by two very small dots in a line transverse to the wing; five hyaline drops in third posterior cell, two bordering on posterior margin of wing, two approximated to fifth-vein, and one bordering on the sixth (anal) vein considerably removed from the margin; four obscure hyaline drops in the less infuscated anal angle of the wing, inside the anal or sixth vein; the coloring becomes more or less dissolved toward the wing base, the second basal cell being mostly clouded on distal half. Third vein bristly to a point about opposite or a little beyond termination of second vein, first vein bristly nearly

all of its length. The markings of the wings are nearly black, or brownish black. Halteres pale tawny, knob pale lemon yellow.

Length (with abdomen curved under), hardly 3 mm.; of wing, 3½ mm.

It is quite probable that a separate genus will have to be created for this form, at some future time, based on the shape of the wings, the bristly third vein, and the four bristles of the scutellum.

NOTE ON HEXACHÆTA AMABILIS LW. A single specimen of this most handsomely marked trypetid was taken with the preceding at Chacaltianguis, December 31, on foliage of plants in the edge of the woods. The species of the family Trypetidæ are remarkable for their handsome markings, but this species, while possessing no other colors than black, dilute brown, and two shades of yellow, is one of the most beautifully marked species of this beautifully marked family.

The markings of the wing in this specimen are of a deep shining black. Loew does not mention the hyaline drop in proximal end of distal cell, or leaves it to be implied when he likens the pattern to that of *H. eximia*. According to Macquart's figure of the latter (Dipt. Exot. Sup. 4, pl. 27, fig. 3), and allowing for the modification in Loew's text, I would not call the pattern of *H. amabilis* at all similar to that of *H. eximia*. Loew's description of the wing pattern agrees perfectly in nearly every detail with the present specimen. He described only the ♂. The present specimen is a ♀.

The middle femora in this female specimen are hardly at all black, and the hind femora are only a little black on inside and outside, the rest being all yellow; there are two patches of black on pleuræ below wing bases, these patches being separated by the longitudinal pleural vitta of sulphur yellow, the forward portion of the pleuræ dissolving into brownish fulvous. The head is pure deep lemon yellow, the eyes of a purplish red (in dry specimen); front about two-sevenths width of head, hardly narrowed anteriorly, with three black frontal bristles on each side directed forward and inward, two weaker ones behind on each side directed backward and not inward, and a pair at each

vertical angle with two short pairs between them. Ocellar bristles consisting of one extremely weak pair directed forward. The antennæ, face, front, cheeks, occiput, palpi, and proboscis are all of the pure light yellow; only the labella tinged with fulvous, the arista brownish, the ocellar spot blackish, and the bristles on head black. Claws and pulvilli just a little elongated. Length, 6 mm.; of wing, 6 mm.

ADDITIONS TO THE FLORA OF COLORADO. II.

BY ALICE EASTWOOD.

1. *Lepidium campestre* R. Br. Rare along the Platte River, near Denver, July, 1892.

2. ARABIS PULCHRA Jones. Grand Junction.

3. *Saponaria officinale* L. Along the railroad, Denver, July, 1892.

4. Malvastrum leptophyllum Gray. Along McElmo Creek, June, 1892.

5. *Malva rotundifolia* L. Introduced at Denver, but not common.

6. *Erodium cicutarium* L'Her. Along the Grand River near the opening of the cañon, Denver. Not common.

7. PSORALEA CASTOREA Watson. Grand Junction on the mesa across the Gunnison River, May, 1892.

8. *Onobrychis sativa* L. Escaped from cultivation near Ridgway, June, 1892.

9. ASTRAGALUS DESPERATUS Jones. Collected at Grand Junction and on the McElmo Creek, Colorado, May and June, 1892.

10. ASTRAGALUS CICADAE Jones n. sp. Collected at Grand Junction along the railroad track that goes to the coal mine, May, 1892.

11. ASTRAGALUS ANISUS Jones n. sp. Collected at Pueblo by Miss Alida P. Lansing in 1892, and by the writer in poor specimens in Southwest Colorado near Mancos in 1890.

12. ASTRAGALUS WETHERILLII Jones n. sp. Collected along the Grand River between Grand Junction and De Beque, May, 1892.

13. ASTRAGALUS LANCEARIUS Gray. Collected at Mancos where it is common, June, 1892.

14. ASTRAGALUS ASCLEPIADOIDES Jones. This remarkable astragalus grows at Grand Junction along the railroad to the coal mine, June, 1892.

15. ASTRAGALUS NUTTALLIANUS, DC. Common at Grand Junction, May, 1892.

16. ASTRAGALUS GRALLATOR Watson. This was incorrectly reported as *A. Grayi* in Additions I, Zoe, ii, 3.

17. ASTRAGALUS AMPHIOXYS Gray. Common at Grand Junction and Durango, May and June.

18. ŒNOTHERA BRACHYCARPA Gray. This was reported as *Œ. triloba* in the article mentioned above.

19. ŒNOTHERA CARDIOPHYLLA Torr. Grand Junction, June, 1892.

20. ŒNOTHERA ALYSSOIDES Hook. & Arn. var. MINUTIFLORA Lindl. Grand Junction on the adobe desert, May, 1892.

21. OPUNTIA WHIPPLEI Eng. & Torr. Durango and Mancos on rocky hills, June, 1892.

22. LIGUSTICUM EASTWOODÆ Rose ined. n.sp. Common above timber line in the La Plata Mountains, August, 1892.

23. PEUCEDANUM AMBIGUUM Nutt. var. LEPTOCARPUM C. & R. This was wrongly reported in Additions I as a variety of *P. nudicaule.*

24. *Scabiosa atropurpurea* L. Escaped from cultivation at Durango, August, 1892.

25. BRICKELLIA BRACHYPHYLLA Gray. Mesa Verde, August, 1892.

26. BIGELOVIA NEVADENSIS Gray. Mesa Verde, August, 1892.

27. TOWNSENDIA STRIGOSA Nutt. Along McElmo Creek, June, 1892.

28. ASTER FRONDOSUS T. & G. Collected in South Park by Miss Alida P. Lansing.

29. *Anthemis Cotula* L. Sparingly introduced at Denver, August, 1892.

30. *Chrysanthemum Leucanthemum* L. Collected at Denver along the Platte, and at Irwin not far from timber line and near a house shattered by an avalanche.

31. SAUSSUREA ALPINA DC. var. LEDEBOURI Gray. This was collected by Miss Alida P. Lansing, near Farnham, Colo. It is much further south than ever before reported.

32. *Cichorium Intybus* L. Introduced from gardens, Denver.

33. *Tragopogon porrifolius*, L. Escaped from cultivation throughout the State.

34. STEPHANOMERIA EXIGUA Nutt. Grand Junction, May, 1892.

35. LYGODESMIA EXIGUA Gray. Grand Junction, May, 1892.

36. AMSONIA ANGUSTIFOLIA Michx. var. TEXANA Gray. Grand Junction on the mesa across the Gunnison River, May, 1892. This is very showy with its many clusters of blue flowers.

37. PHILIBERTIA UNDULATA Gray. Cañon City, along the Hog-Back, June, 1892.

38. KRYNITZKIA PTEROCARYA Gray. This is common at Grand Junction, May, 1892.

39. AMSINCKIA TESSELLATA Gray. Collected at Morrison by Miss Lansing.

40. LYCIUM PALLIDUM Miers. McElmo Creek, June, 1892.

41. *Datura Stramonium* L. At Denver, along the Burlington R. R., near Thirty-first Street.

42. *Linaria vulgaris* Mill. At Durango and in Platte Cañon, near Estabrook, August.

43. PENSTEMON STRICTUS Benth. Durango, July, 1891.

44. MIMULUS RINGENS L. Along the Platte, near Denver, July, 1892.

45. CORDYLANTHUS RAMOSUS Nutt. This was probably reported from Southwest Colorado as *C. Kingii.* It is found at Mancos under cedars and piñons, August, 1892.

46. *Nepeta Cataria* L. Denver, Colorado Springs, 1892.

47. *Brunella vulgaris* L. Common everywhere near water.

48. PLANTAGO PUSILLA Nutt. Grand Junction, May, 1892.

49. *Chenopodium urbicum* L. Evidently introduced. Along a roadside in North Denver, September, 1892.

50. MONOLEPIS PUSILLA Torr. Under sage brush, Grand Junction, May, 1892.

51. *Atriplex roseum*, L. Introduced at Denver. Rare.

52. ERIOGONUM DIVARICATUM Nutt. Grand Junction, May, 1892.

53. ERIOGONUM GLANDULOSUM Nutt. Rare at Grand Junction, May, 1892.

54. ERIOGONUM BREVICAULE Nutt. Grand Junction, May, 1892.

55. RUMEX HYMENOSEPALUS Torr. Grand Junction, May, 1892.

56. ALLIUM NEVADENSE Watson (?) Grand Junction, May, 1892.

57. NOTHOSCORDUM STRIATUM Kunth. Mancos and Grand Junction, May.

58. CALOCHORTUS FLEXUOSUS Watson. Along McElmo Creek, June, 1892.

59. SPARGANIUM EURYCARPUM Engelm. Along the Platte, Denver, September, 1892.

60. SPOROBOLUS CONFUSUS Vasey. Denver, July, 1892.

61. *Dactylis glomerata* L. Denver. Introduced.

62. *Polypogon Monspeliensis* Desf. Denver. Introduced.

63. *Eragrostis major* L. Common at Denver. Introduced.

64. *Poa brevifolia* Muhl. Denver, along a ditch. Introduced.

65. GLYCERIA ACUTIFLORA Torr. Denver.

66. GLYCERIA FLUITANS R. Br. Denver.
67. GLYCERIA PALLIDA Trin. Denver.
68. GLYCERIA GRANDIS Watson. Denver.
69. AGROPYRUM GLAUCUM R. & S. var. OCCIDENTALE V. & S. The Common Blue-Stem. Denver.
70. AGROPYRUM TENERUM Vasey. Denver.
71. *Elymus Virginicus* L. var. *submuticus* Hook. Denver.

RESTRICTED DISTRIBUTION OF FRESH WATER OLIGOCHÆTA.

BY GUSTAV EISEN.

The geographical distribution of fresh water oligochæta, as compared to fresh water algæ, is most interesting and unexpected. It is well known that a majority of species of fresh water algæ are cosmopolitan, and even locally widely distributed, being rarely confined to special localities, such as a single pond, spring, or lake. An alga which is found in one spring or creek is almost certain to be found in some other spring or creek in the vicinity. Many species have a world-wide distribution, while others of rare occurrence have been found in distant localities. With the fresh water oligochæta this manner of occurrence is exactly opposite. Few species are found in countries far apart. Not one species is found distributed all over the world, while by far the greatest number of species are endemic in certain districts, or even confined to certain ponds, lakes, rivers, creeks, or springs outside of which they do not appear to thrive. With the genera this, of course, does not hold good. True, Lumbrici are found the world over, but it is more than probable that whenever the same species is found in very distant countries, it has been artificially introduced there with economic or garden plants brought along by nursery men or horticulturists. The distribution of fresh water oligochæta is as yet only imperfectly known, and it is too early to compile their geographical distribution, but enough is known to warrant us to believe that there are some powerful influences in nature which operate on and curtail their

geographical distribution, which influences are not interfering with the fresh water algæ inhabiting the same localities.

Nearly all the California fresh water oligochæta which have been described to date, have been found in single ponds or springs, and have been vainly searched for elsewhere. Thus in the Mountain Lake, near San Francisco, at the Marine Hospital, several forms occur which are not found outside of that little pond, as a pond it really is. We may mention *Sutroa rostrata* and *Limnodrilus silvani* (long form) among others. In Laguna Puerca, which is only a few miles from this place, we look in vain for these species, but here another species and genus occurs, which again is found nowhere else. This genus is a new one, related to Sparganophilus, of the family *Rhinodrilidæ*. This family is an American one, still one species of Sparganophilus has lately been found and described by Benham, from a very limited spot in the River Thames, in England. Mr. Benham is convinced that the cocoons of this worm have been brought there with American plants, as the locality where the worm is found is, in reality, restricted to a few yards square. *Sutroa rostrata* is similarly restricted, it being only found in a place not over a hundred feet square in the pond mentioned above. But, if we return to our San Francisco species, we find that in Laguna Merced, not over a mile from Laguna Puerca, we look in vain for any of the species found in the two other ponds. *Sutroa alpestris* again has been, so far, only found in a few small springs around Donner Lake, in the Sierra Nevada, and I have not been able to find it elsewhere. *Telmatodrilus vejdovskyi* again has, though extensively searched for, only been found in a single meadow in the Sierra Nevada, in Fresno County. Eclipidrilus is another remarkable form, found in two little springs at Alpine Meadows, on the head waters of the middle-fork of King's River, in the Sierra Nevada.

Ocnerodrilus occidentalis has only been found in a plat of garden one hundred feet square in Fresno County, but nowhere else in California, nor have I been able to find any other species of Ocnerodrilus in this State. *Ocnerodrilus beddardi* occurs only in the Cape region of Baja California, but does not transgress its limits, and does not reach the main-land of Mexico, across the

Gulf of California. In Sonora I found only *Ocnerodrilus sonoræ*. In Central America the species were equally confined. In the vicinity of the City of Guatemala I found four distinct species of Ocnerodrilus, each one of which was confined either to a certain garden or to a certain creek or pond, while in parts of the country other species were found equally restricted. The Enchytræides are almost equally circumscribed geographically. A species of Pachydrilus could only be found in a single little creek (Rush Creek, Fresno County) in the Sierra Nevada, and I searched for it in vain elsewhere, though small creeks abound there everywhere not one mile apart. Another gigantic Enchytræus, several inches long, was confined to a single little meadow on the south fork of King's River. Only one or two of the California limicolids have a wider distribution, and they are species of Limnodrilus, which genus shows a greater adaptability to different localities than any other. With such restricted geographical distribution it is to be expected that many interesting and aberrant oligochæta may yet be found in almost every isolated water course or pond, especially in countries where, through the division of seasons into dry and rainy, the water courses and ponds are comparatively scarce and disconnected.

CONTRIBUTIONS TO WESTERN BOTANY. No. 4.

BY MARCUS E. JONES.

Astragalus candidissimus (Benth.) Wat. Probably from a woody root if not shrubby, rather tall, a foot or two high at least; stems flexuous; peduncles one and one-half times longer than the leaf, rather stout; stipules minute. Mr. Brandegee's specimens from Magdalena Island have about eight pairs of leaflets, obovate-cuneate, rounded or emarginate at apex, scarcely petiolulate, appressed silvery silky, five lines or less long; whole leaf three inches long; petiole an inch or less long; flowers, in dense spikes which are two inches long, five lines long, almost sessile, minute bract twice as long as pedicel; calyx black-hairy, two lines long, cleft deeper on the upper side, teeth short, triangular, one-half the length of the campanulate tube; pods sessile,

membranous, inflated, an inch long when fully developed, minutely pubescent, oval, apparently circular in cross-section, with a short triangular point, very slightly pointed at base, horizontal, dorsal suture scarcely evident, generally sulcate slightly dorsally, ventral suture impressed about a line deep in the middle of the pod and seed-bearing for half the length of the pod, not impressed at base or apex, deeply sulcate ventrally to about one-third the depth of the pod. seeds small, many; young pods more pointed and hoary pubescent.

Other specimens from Scammon's Lagoon, Lower California, have oblanceolate leaflets, six lines long, neither truncate nor acute, twelve to fifteen pairs; no petiole; leaf three to six inches long; calyx, bracts, and spikes the same as above; flowers light purple, sides of banner and tip of keel dark; blade of keel two and one-half lines long, bent from base of blade to the blunt tip into one-third of a circle, very short and thick; broadly lanceolate wings, little ascending and a little longer than keel; banner ovate in outline, large, curved in an arc of a circle beginning at tip of calyx teeth, apex erect, two lines longer than keel; pods inclined to be ovate and more pointed, minutely pubescent, less deeply sulcate, but otherwise the same. The heads resemble *A. adsurgens*. Manifestly allied to *A. diphysus* and *lentiginosus*, despite the one-celled pod, but nearest to *A. oocarpus*. The whole section to which this belongs, from *A. curtipes* to *A. Douglasii*, is in great need of careful and extensive field studies. I have no doubt that there are twice as many species recognized as exist. This might be *A. vestitus* as far as the description goes, for some of the flowers might be called ochroleucous if taken alone.

Astragalus anemophilus Greene. (Includes *A. Miguelensis* Greene.) This is very closely related to *A. candidissimus*, and may prove to be identical with it, and is quite likely to be *A. vestitus*. It differs from the former so far as the type goes in the stipules being connate opposite the petioles, and in the white-woolly pubescence. The flowers are too immature to determine what they are. The pubescence of *A. candidissimus* is woolly or tangled on the calyx, but elsewhere is of straight or slightly tangled hairs which are appressed. The leaflets of this species

are in ten to fourteen pairs, oval to elliptical, truncate to acutish, and sometimes apiculate, four lines long; petiole an inch long or none; flowers in a short and rather loose spike; pods hoary to almost glabrous; calyx two lines long, campanulate, teeth triangular and very short; pods the same as in *A. candidissimus*, also the pedicels, bracts, and peduncles. This is probably woody at base. The calyx is cleft deeper above, little gibbous, teeth nearly equal; flowers ochroleucous and ascending. Described from the type in the California Academy. Collected by E. L. Greene at Cape San Quentin, May 10, 1885. So far as the description goes, this also might be *A. vestitus*.

Astragalus Miguelensis Greene. Probably woody or shrubby at base; stems, peduncles, leaves, bracts, pedicels and keel the same as in *A. candidissimus*; leaflets in ten to thirteen pairs, two-thirds of an inch long or less; flowers in a dense head or very short spike; calyx short-campanulate, cleft deeper above, teeth triangular-subulate, unequal, the lower nearly the length of the tube which is one and one-half lines long; flowers inclined to be reflexed, ochroleucous; keel three lines longer than calyx teeth; wings narrowly and obliquely lanceolate, and slightly ascending, two lines longer than the keel; banner ascending in a broad arc, and tip nearly erect, oval, a line longer than the wings; pods in a dense head, an inch long, exactly those of *A. candidissimus*, but perfectly glabrous, membranous and a little stiffer than the other, striate and faintly corrugated crosswise; seeds dark and nearly round. The upper stipules are not connate, though the lower ones are. The spike and flowers remind one of *A. Canadensis*. Collected by E. L. Greene at San Miguel Island, Cal., September, 1886. As Mr. Greene has suggested, this is probably a form of *A. anemophilus*, unless there is a good character in the flowers, and I doubt that. This plant from the Herb. Cal. Acad. is ticketed in the handwriting of Mr. Greene, but differs in a marked degree from his description in Pittonia i, 33, and it differs from *A. anemophilus* more than that does from *A. candidissimus*. The pubescence is woolly but with some straight hairs in places. As the stipules vary there is really nothing but the woolly pubescence to keep *A. candidissimus*, *vestitus*, *anemophilus* and *Miguelensis* from being combined; this is, however,

a character of great weight so far as my knowledge of the genus goes, yet it may be variable in the southern and hot regions.

Astragalus fastidiosus (Kell.) Greene. *Phaca fastidia* Kell. Hesperian iv, 145. I doubt if this is a valid species. It is too near *A. curtipes*, and all of the species given in the Botany of California along with *A. curtipes* are founded on weak distinctions. This species is like its relatives, not only inclined to be shrubby at base but most manifestly so. The leaflets are two to six or more lines long, obovate to almost linear, obtuse or retuse, narrowed at base and about nineteen; peduncles at least six inches long; calyx teeth shorter than the tube or not longer; pod semi-ovate, narrowed but not acuminate at base, apex acuminate or rather short-pointed, incurved; stems densely white-hairy; leaves almost glabrous to white-pubescent. Described from type collected on Cedros Island, by E. L. Greene.

Astragalus pachypus, Greene. This most distinct and very interesting species would be referred to the *A. nudus* section if it were not almost two-celled. This frequent finding of plants that destroy all our notions of classification into Astragalus proper and Phaca, leads one to hope that the division of the pod will take a minor place, so that species that are otherwise related may be grouped together and not widely separated, as they are at present in the common methods of classification. In addition to the published description I find that the pod is very much laterally compressed and is one-celled at the apex.

Astragalus collinus, (Dougl.) var. *Californicus*, Gray. *A. Californicus* Greene, Bull. Cal. Acad., iii, 157. This plant reminds one forcibly of *A. Drummondi* in habit. It is erect; leaves without a petiole to speak of, two to three inches long; leaflets about ten pairs, set very close together, three-quarters of an inch long, obtuse or emarginate; peduncles about three times as long as the leaves; calyx campanulate or occasionally very shortly cylindric, tube two lines long, one and one-half lines wide, teeth one-half a line long and broadly triangular, calyx rather sparsely short-hairy, yellowish; legume vetch-like, one and one-half inches long and two and one-half lines wide, acuminate at base, on a stipe four lines long, sharply acute at

apex, and pendulous; keel exceeding the calyx teeth by two lines, wings one and one-half lines longer than keel, and banner two lines longer than wings, banner erect, wings and keel arched, broad tip of keel incurved at a right angle. Otherwise, as in *A. collinus*. Described from the type collected at Yreka, Cal., by E. L. Greene. This differs from *A. collinus* (*Phaca collina* Hooker) as described in Flora of North America, T. & G., 347, in the leaflets being closely set and not "remote," shorter, peduncle longer, calyx not "tubular" nor "elongated" but campanulate as a rule, and in the banner being much longer than the elongated wings. It differs from the description given in King's Rep., p. 444, in the pod being linear and not linear-oblong. Watson there gives the calyx as oblong-campanulate or cylindric, and the pod as an inch long. Canby, in Botanical Gazette, xii, 150, gives it as his opinion that this is only a variety of *A. collinus*. No one seems to have remarked upon the short keel and close set leaflets. If these are common to the true *A. collinus*, then, no doubt, this is a form of *A. collinus*.

Astragalus Mogollonicus, Greene, Torrey Bulletin viii, 97. This is only a form of *A. Bigelovii* apparently, as it is a common thing for *A. Bigelovii* to be very hirsute with yellow hairs, and the pod is from oval and short pointed to lanceolate and rather long pointed. The immature pod of this plant is straight and cylindric-lanceolate. Rusby's specimen is fully as large as *A. Bigelovii* and like it in all respects so far as can be seen, but it has no mature fruit, while Greene's specimen, the type, is very young and without fruit at all. I have a specimen of *A. mollissimus* from the same region, the San Francisco Mountains, Ariz., that, so far as the yellowness is concerned, would pass for *A. Mogollonicus* were it not for the cylindrical and perfectly glabrous pods.

Astragalus calycosus Torrey var. *scaposus* (Gray) *A. scaposus* Gray, Proc. Am. Acad. xii, 55. *A. candicans* Greene, Bull. Cal., Acad. i, 156. It is strange that Dr. Gray did not recognize the close relationship of this plant with *A. calycosus*. It has only the remotest resemblance to *A. Missouriensis* and no relationship to it. The true *A. scaposus* differs from *A. calycosus* only in the short and triangular calyx lobes and the less

deeply cleft wings, and longer calyx tube. It is a little more robust and with larger flowers, but I have specimens from the Buckskin Mountains, Northern Arizona, on the border of Utah, with the calyx lobes one-half as long as the tube, and not deeply cleft wings. My specimens of *A. scaposus*, named by Dr. Gray himself, show a great diversity in the lobing of the wings. Specimens from Southeastern Utah, collected by Miss Eastwood, have a short calyx and short teeth, but are otherwise as in *A. calycosus*. I have given a full description of *A. calycosus* in "Contributions No. 3," so that it is not necessary to repeat the character of the pod, which differs in no respect, when fully developed, from *A. scaposus*. I have compared the type of Mr. Greene's *A. candicans* and find that it differs in no respect from *A. scaposus*.

Astragalus Hosackiæ, Greene, Bull. Cal. Acad. i, 157. This is a common form of *A. humistratus*. I have plenty of specimens, gathered along with the usual form of *A. humistratus*, that have the pod of *A. Hosackiæ* and the general form of the leaves of *A. humistratus*. I have others with the leaves and general aspect of *A. Hosackiæ*. Mr. Greene's species seems to grow in the shade, where the leaves become wider. The pod of *A. humistratus* varies greatly, being curved to a half circle or nearly straight and short; it is also a little sulcate dorsally often. The crowding of the leaflets and leaves is of common occurrence.

Astragalus Gilensis Greene, Torrey Bull. viii, 97. This is a very distinct and interesting plant, but belongs to the Homalobi. The keel is incurved and sharply acute, one-half a line shorter than the wings, banner one to one and one-half lines longer than wings, the keel exceeds the calyx teeth by a line only; calyx tube one and one-half lines long, narrowly campanulate equaling the subulate teeth; bracts hyaline, acuminate, lanceolate, one and one-half lines long, longer than the short pedicel; calyx contracted at base; flowers in a head which is one-half an inch long; pod flattened laterally, about two-seeded, obliquely ovate-oblong, one-celled, no intrusion of sutures, thin-chartaceous, dorsal suture about straight, ventral much arched, the pod seems to be wrong side up but it is not so, sharp pointed,

both sutures prominent externally, pod three lines long; lower stipules large and hyaline and densely imbricated; leaflets five to eight pairs two to three lines long, elliptical and appressed silky; leaves two inches long, root woody and large. This seems to be near to *A. miser*. This description is drawn from the type collected on the Gila River, by E. L. Greene. I do not attempt to give a full description, as the other characters are given by Mr. Greene.

Astragalus insularis, Kellogg. I do not know where this was first published. Annual or flowering the first year. The small plants have the habit of *A. Geyeri* and a remote resemblance to *A. triflorus*. Many-branched at the summit of the root and rather slender, lateral branches probably prostrate or ascending, and the central ones erect or nearly so. Flowers two lines long, keel, wings, and banner nearly equal, not curved; very campanulate or globose calyx sessile and as long as the subulate-triangular teeth, calyx and teeth scarcely over a line long in all, calyx reflexed in fruit; pods broadly ovate, sessile, membranous, one-celled and not sulcate, sutures scarcely visible, pod much inflated, about five lines long, rounded at base and with a triangular laterally flattened, sharp apex which is one or two lines long, the beak is flattened so as to be no thicker than paper in the second form given below, cross-section of pod apparently circular; peduncles one to two inches long, rather stout, shorter than the leaves, three to six-flowered, racemosely and remotely on the upper half of the peduncle; leaves with three to five pairs of elliptical-linear and apiculate leaflets which occur on the upper half of the rachis or common petiole; whole plant, even to the pods, minutely pubescent. Cedros Island, collected by Dr. Veatch, 1877, June 4th. Another form, if such it be, is the upper part of a stem that may have been a foot or two long; it has seven to nine pairs of acute leaflets, six lines long, no proper petiole; leaves four inches long; peduncles two and one-half to three inches long and stout; pods globose but with the peculiar beak three lines long. Cedros Island, Dr. Veatch. This species seems to belong near *A. macrodon*. *A. Pondii* Greene, Pittonia, i, 288, is the same so far as the published description goes.

Astragalus streptopus Greene, Bull. Cal. Acad. i, 156. This I take to be a form of *A. Nuttallianus*. The only difference seems to be that the flowers are a little more numerous and racemose and the leaflets are often retuse. I have specimens with racemose flowers, and others with the pods wrong side up by the twisting of the pedicels, and otherwise intermediate.

Astragalus albens Greene, seems to be a good species but very close to *A. Nuttallianus*, though Watson places it near *A. tricarinatus*. It would pass for a form of *A. Nuttallianus* with wider leaves and tips of pods. If this is a perennial it blooms the first year. It is prostrate or ascending, six inches or more long, many branched from the base; raceme loose; peduncles twice as long as the leaves, which are one to two inches long, petiole over one-half of the whole; keel purple tipped, very broad and blunt, longer than the wings and equaling the broad banner, two lines longer than the calyx and teeth, which are a line long, teeth equaling the campanulate tube, pedicel nearly as long as the tube; pod broadly linear, narrowed and pseudo-stipitate at the base, broadest at apex, which is sharp-pointed and triangular, laterally compressed, minutely and rather sparsely short-pubescent, not at all silky except when very young, two-celled. Described from the type.

Astragalus Rusbyi Greene, is a good species. I also collected it in abundant material near Flagstaff, Ariz., 1884.

Astragalus malacus Gray, var. *Laynæ* (Greene). *A. Laynæ* Greene, Bull. Cal. Acad. i, 157, belongs to the Micranthi. In addition to the characters given I find the flowers are purple, one-half an inch long; wings narrow, just surpassing the keel, and banner but little longer; banner ascending; keel apparently with an obtuse short beak; leaves almost oval, very villous-woolly, the hairs very fine, not much tangled in the type but much so in Parish's specimens, attached by the small pustulate base, the leaflets in the Mrs. Curran specimens are obovate: the flowers seem to be reflexed and the pods erect; calyx campanulate, nigrescent, three lines long, with very short, triangular, black-hairy teeth; peduncles very stout, twice longer than the four-inch-long leaves, or subscapiform, and eight inches long in Mrs. Curran's speci-

mens; stipules large, connate below, acuminate and hyaline. In Mr. Parish's specimen the pod is nearly two inches long, linear, contracted at base and sessile, sulcate dorsally, and dorsal septum intruded to the middle of the cell, apex of pod acuminate to an almost thread-like tip which is laterally compressed, pod slightly obcompressed, finely corrugated, coriaceous, rather sparsely villous-woolly when ripe, ventral suture rather prominent; pedicels very short; bracts ovate and rather large. In Mrs. Curran's specimen the pod is completely divided by the intrusion of the dorsal sulcus from the base nearly to the apex, much obcompressed by necessity from the curving of the pod into a circle, ventral suture ridged; perennial and many branched from the base, erect, stem very short.

The above descriptions are drawn from the types. I find that the pods have much shorter pubescence which is more generally appressed; the plants are less branching and peduncles more inclined to be subscapose, and the flowers are more inclined to be racemose; the sulcus is more open and wider; pods narrower than *A. malacus.* Specimens collected by Mr. Brandegee, at Inyo, Cal., April 15, 1892, clearly connect the two. The flowering specimen of the Herb. Cal. Acad. has white or ochroleucous flowers with only a tinge of purple at the tip of the parts; calyx that of *A. Layneæ* and pods of *A. malacus* with the short pubescence on them of *A. Layneæ;* pods not at all obcompressed but decidedly compressed; general habit of *A. Layneæ.* The fruiting specimen on the same sheet has nearly the calyx of *A. malacus* and its branching caulescent habit, but the pods are those of *A. Layneæ.* I also have specimens of *A. malacus* from Western Nevada with pods much like those of *A. Layneæ* but nothing to warrant the reference that Mr. Brandegee's specimens require. I find in Mr. Brandegee's specimens that the keel is as often without a beak as with, and so that character fails.

Astragalus Gibbsii Kell. (*A. cyrtoides* Gray.) The type in the Herb. Cal. Acad. has eight to ten pairs of obovate-cuneate leaflets which are so deeply notched as to be obcordate occasionally, at other times they are scarcely notched at all, seven lines or less long, four lines or less wide, shortly petiolulate; petiole less than an inch long; stems and peduncles grooved; corolla

and calyx yellow, the latter with short wool; calyx tube three lines long, two lines wide, teeth a line long and triangular and stout; calyx about as large at base as apex and so short-cylindric; the corolla does not extend more than five lines beyond the calyx teeth; the short very blunt keel whose tip is bent into a semi-circle surpasses the teeth by three lines; the broadly lanceolate wings which are as wide as the keel surpass it by two lines; the broadly ovate banner is sharply arched just beyond the calyx teeth into an erect position and so does not extend as far as the keel; the ovate woolly bracts are hyaline and a line long and equal the stout pedicels; lower part of stem is absent and there is no fruit; stipules triangular, short, green. Collected by G. W. Gibbs on the headwaters of the Carson River, Cal. Read before the Cal. Acad. Nov. 18, 1861. The whole plant has short spreading wool or hairs and is rather canescent; pedicels attached by one corner of the calyx; leaves four inches long; peduncles six inches long, very stout; flowers six to eight, subcapitate.

Astragalus cyrtoides Gray, collected by Lemmon in Sierra Valley, Cal., is many stemmed from a woody root, stems often slender, erect and scarcely sulcate, a foot high, flexuous; pubescence even to the calyx the same as in *A. Gibbsii;* leaflets six to eight pairs, from cuneate and almost lobed at apex to oblanceolate and truncate, six lines or less long; petiole seldom over one-half inch long; leaves three inches long; stipules triangular and like those of *A. Gibbsii* but more acute; peduncles four to six inches long, not very stout, grooved; flowers loosely spicate; pedicels two lines long, twice the length of the ovate, hairy bract, not very stout; calyx narrowed, cylindric-campanulate, four lines long, one to two lines wide, scarcely gibbous at base but pedicel bent at point of insertion to a right angle; teeth the same as those of *A. Gibbsii* or narrower; flowers the same but wings surpassing the keel only a little; pod an inch long exclusive of the one-half inch long stipe, acuminate at both ends and sharper at base, three lines wide, one and one-half lines thick, cross-section, shallow-obcordate, short-pubescent with erect hairs, one-celled, neither suture impressed, but pod dorsally sulcate, ventral suture

prominent and sharp edged externally, pod arched into one-third to one-half a circle, erect.

Specimens collected by Mr. Brandegee at Milford, Cal., June 26, 1892, are substantially those of Mr. Lemmon but calyx gibbous, more cylindric; pods less acuminate, and stipe just equaling tip of calyx teeth; pods shorter, slightly arched, both sutures prominent, not at all sulcate or with only a trace of it.

My own specimens gathered at Carson City, Nev., May 23, 1882, are exactly the type of *A. Gibbsii.* Those collected also by me at Empire City, Nev., June 20, 1882, and distributed as No. 3829 have the flowers of *A. Gibbsii* but the calyx a little narrower; pedicels as long or two lines long; leaflets six to ten pairs, like those of Mr. Lemmon's specimens, short-woolly, and whole plant canescent throughout; pods very short-pubescent, not at all sulcate, cross-section about circular, pod an inch long, bent into fully or more than a semi-circle; stipe equaling or twice as long as the calyx; pods oblong-linear, shortly and equally acuminate at each end, stems branched above, a foot high. Other specimens gathered at the same place have pods the same width as the above but only one-half an inch long, very sharply acuminate; stipe shorter than the calyx; pod slightly arched, otherwise as above.

Astragalus recurvus Greene. This is *A. obscurus* Watson. I have specimens of *A. obscurus* from Nevada collected by myself with recurved pods, and also specimens from Northern Arizona collected by me near Flagstaff in 1891 with the pods curved fully as much as the type and with crimped edges.

Astragalus adsurgens Pall. This species is in great need of a new description for the lobes of the calyx are often as long as the tube, the leaflets vary from linear lanceolate and one and one-half inches long to oblong-elliptical and obtuse or acute. The pods are one-celled, sulcate dorsally from one-fourth to one-third their width and dorsal septum produced as much more into the pod, but never two-celled; the flowers are purple or white. My specimens were named by Gray.

Astragalus circumdatus Greene. Scytocarpi, and nearest to *A. Chamæleuce*, but widely different from it. In uniqueness it ranks

along with *A. pachypus*. Apparently loosely cæspitose from a much branched woody base, two to five inches high or more, stems rather slender though not for the size of the plant, nodes one-fourth to one-half inch apart, or even closer; stipules rather large for the plant, scarious, ovate, almost connate, free; stems three to five inches long, ascending or some of them horizontal, almost glabrous; leaves two to three inches long with petiole which is nearly one-half the length; leaflets eight to twelve pairs, one-fourth inch or less apart, truncate or emarginate, oblanceolate to oval, one to four lines long, very decidedly petiolulate, very sparsely pilose, or almost glabrous, the leaves are so small that though the hairs are short they are still long for the size of the leaf; peduncles slender, shorter than the petiole and far overtopped by the uppermost leaves which are not at all reduced but are the largest of all; flowers subcapitate, five to twelve, on slender pedicels which are one to one and one-half lines long and twice the length of the ovate, hyaline, rather pilose bract; flowers horizontal, four lines long, ochroleucous in the dried specimen; calyx tube campanulate, one and one-half lines long, a little longer than the subulate lobes, whitish, rather densely short-hairy and canescent; banner very wide at base and narrower upwards, emarginate, bent at a right angle and erect, a line longer than the keel; keel nearly straight but tip incurved at a right angle and acuminate, the erect part nearly as long as the rest of the blade; wings apparently lanceolate, ascending and little exceeding the bend in the keel; pod apparently horizontal or reflexed, fleshy, coriaceous, one-celled, neither suture impressed but both very thick and prominent and rounded externally, pod minutely and sparsely pubescent when mature, or glabrous, faintly corrugated, abruptly acute with a stout beak and almost acute at the sessile base, six lines long or less, half oval to almost elliptical, ventral suture nearly straight, dorsal arched, apparently a little compressed when young but nearly round thereafter in cross-section, faintly bisulcate on the ventral side but the obcompressed appearance is doubtless due to the pressing, as other pods are as markedly compressed from the same cause. The flowers and pods lie among the leaves but are not concealed by them, usually only two to four pods mature on the

same peduncle and are scattered. The immature pods are quite appressed-hairy. Described from the type in the Herb. Cal. Acad. Collected by Mr. Lemmon at Hanson's Ranch, Lower California, July, 1888.

ASTRAGALUS ANISUS, n. sp. This is near the Mollissimi. Very low, two or three inches high and very short-stemmed, perennial, silky pubescent, with rather long and loosely appressed hairs which are slender, very echinate, and attached by the middle; stems, stipules, and leaves silvery with long hairs; peduncles less pubescent; calyx nigrescent only, with sparse hairs; pods softly and rather thinly pubescent with short hairs. Leaves two inches long and petiole as long as the rachis, leaflets three to six pairs, obovate to oval, two to three lines long. Peduncles longer than the leaves and with stout fruiting pedicels two lines long. Flowers erect or spreading, six to ten and probably subcapitate; calyx-tube broadly cylindric, four lines long exclusive of the subulate teeth which are less than a line long; corolla not seen; pods almost an exact oval, very obtuse at each end but apiculate at apex and abruptly contracted into a pseudo-stipe which is very short, at base two-celled, six lines long, chartaceous, finely corrugated, sulcate ventrally but not deeply, and slightly sulcate dorsally often. Collected at Pueblo, Colo., by Miss A. P. Lansing, and communicated by Miss Alice Eastwood.

ASTRAGALUS WETHERILLI, n. sp. With the habit of *A. triflorus* and nearest to *A. allochrous* in general character except the jointed pedicel. Ascending twelve to eighteen inches high and many stemmed from a rather woody, perennial root, glabrous or very sparsely pubescent on the upper stems and rachis; calyx nigrescent with short hairs; young pods ashy with minute white hairs, mature pods very sparsely and minutely pubescent. Stipules small. Lower leaves small, one to two inches long, with four to five pairs of obovate rounded to retuse leaflets, two to three lines long; uppermost leaves largest, three to four inches long, including the inch-long petiole; leaflets, six to eight pairs, oval to obovate, obtuse, four lines long. Peduncles one to two inches long and capitately six to eight-flowered, rather stout,

with pedicels a line long in flower and two lines long in fruit, twice as long as the ovate bract. Calyx narrowly campanulate two and one-half lines long including the subulate teeth which are a line long; flowers four lines long, white with pink-tipped banner, keel straight to the abruptly incurved (to a right angle) apex, one and one-half lines longer than calyx teeth, wings just surpassing the keel and upwardly curved so as to conceal it, banner two lines longer than keel, broad, rounded, ascending somewhat; pods three-quarters to an inch long, obliquely ovate and shortly acuminate, obtuse at base but contracted, jointed to the line-long stipe at its apex, thin-chartaceous, not pendulous or purple spotted, sulcate ventrally, not at all dorsally, ventral septum also extended a line deep in the centre of the pod but not at all at each end, straight, dorsal septum bent to an arc of an oval, pod inflated and cross-section nearly round.

Collected at Grand Junction, Colo., May, 1892, by Miss Alice Eastwood, and dedicated to Mr. Alfred Wetherill by request.

ASTRAGALUS CICADÆ, n. sp. This appears to be near *A. megacarpus*, and has the habit and general appearance of *A. amphioxys*. Perennial, depressed, and almost stemless, three to four inches high. Stipules large for the plant, hairy, acute, and connate below. Petioles, peduncles, and leaves silvery with appressed, very acute, echinate, hairs that are fixed by the middle. Leaves about two inches long, with three to four pairs of broadly to narrowly elliptical leaflets, three to four lines long. Peduncles one and one-half inches, long, decumbent, capitately few-flowered, and with pedicels a line long equaling the ovate, acute, hairy bract. Calyx broadly cylindrical, nigrescent with sparse and very short hairs, four lines long exclusive of the subulate teeth a line long; flowers apparently ochroleucous, exceeding the teeth by four lines, keel nearly straight and but little incurved at the obtuse tip, wings a trifle longer, and nearly equaling the slightly ascending banner; pod obliquely oblong lanceolate, one and one-half inches long, shortly acuminate, somewhat incurved, not stipitate, but a little contracted at base, minutely and rather sparsely pubescent,

purple spotted, young pod pulpy and corrugated, mature pod with membranous outer coat very coarsely reticulated transversely and suggesting the wing of a cicada, inner skin stiffer, both sutures much thickened within and pulpy but not much intruded, pod occasionally slightly sulcate ventrally, very acute.

Grand Junction, Colo., May, 1892. Collected by Miss Alice Eastwood.

The following forms, except the first, would readily pass for new species, but in view of the great variability in the pod of *A. Preussii* it seems better to describe them as varieties until the real limits of that species are known.

Astragalus Preussii Gray, Proc. A. A. vi, 222. See also Vol. xiii, 369, and Bot. King's Exp. Rev. Astragalus, Watson.

The specimens collected by Miss Eastwood at Moab, Utah, May, 1892, approach the type very closely. Glabrous throughout except calyx speckled and teeth black with flat, short-twisted hairs fixed by the base, plant a foot high; leaflets oval to narrowly elliptical. Peduncles equaling the leaves, stout, five to ten-flowered; flowers spreading and in fruit ascending, purple, three-fourths of an inch long; pedicels a line long and twice shorter than the ovate, hyaline, acuminate bract; calyx five lines long, two lines wide at base, and one and one-half wide at throat, cleft a little deeper on the upper side, teeth subulate, a line long; keel straight, to moderately incurved at blunt apex and scarcely shorter than the wings, banner elongated, purple veined, ascending; pod with evident sutures, abruptly contracted at each end, and with subulate point at apex a line long, this broad based beak is very characteristic, the stipe is about two lines long, and the pod is oblong elliptical. Otherwise agreeing with the type exactly. Collected by Miss Alice Eastwood at Moab, Utah, May, 1892.

Astragalus Preussii Gray var. LATUS, n. var. Leaves obovate-cuneate to nearly linear; peduncles longer than the leaves; calyx cylindrical; banner shorter and wings longer than in the above; pod nearly round, but ventral suture nearly straight, three-fourths of an inch long, apex subulate three lines long and prow-like, stipe two lines long; pod thick-chartaceous, but not

coriaceous. Plant a foot high, or less, and growing in dense clumps. This is seemingly very distinct, but is connected with the type by forms with ovate pods. In pubescence, pedicels, calyx, and corolla it agrees with the type. Collected by me at Green River, Utah, May 7, 1891, and connecting forms at Cisco at the same date.

Astragalus Preussii Gray var. SULCATUS, n. var. Densely branched from the base which is almost woody, six inches high. Stipules not large lower ones sheathing, hyaline, very broad and blunt. Leaflets about ten pairs as in the type, but generally narrowly oblanceolate, two to four lines long, rachis two to four inches long, and proper petiole very short. Flowers a line shorter than type on pedicels two lines long, which are twice the length of bract. Calyx three lines long, cleft a little deeper than the type and not contracted at throat, otherwise both calyx and corolla as in the type. Pods horizontal, oblong-oval, abruptly contracted at both ends, apex very acute with a short triangular beak, pod round in cross-section, straight, ventrally sulcate a line deep and suture often extended one-fourth of a line deeper, pod much inflated, chartaceous, three-fourths of an inch long, often reddish, but not spotted. Collected by me in abundant specimens May 6, 1891, at Westwater, Colo., and in fruit only by Miss Alice Eastwood, at Cane Spring, Utah, May, 1892. This is so like the variety *latus*, except in the sulcate pod, that it seems best to put it as a variety of the above.

Astragalus pictus Gray var. ANGUSTUS, n. var. Like the type but pods eight lines long, two to three lines wide, oblong-oblanceolate very acute at apex and narrowed gradually into the stipe which is as long as the calyx. Collected in Montezuma Cañon, Utah, May, 1892, by Miss Alice Eastwood.

Astragalus desperatus Jones. Specimens collected by Miss Eastwood have the over-ripe pods almost chartaceous.

Astragalus Coltoni Jones has the pod in one specimen broader and less stipitate, and in another specimen has the leaves much broader, otherwise as in the type.

ASTRAGALUS PALANS. Stems long and flexuous ascending or erect from a perennial root, nodes distant, glabrous throughout

except the sparsely nigrescent calyx. Leaves three to four inches long and with a very short petiole, central ones the largest, leaflets on the lower leaves three lines long and obovate and rounded, eight to ten pairs, central leaves with leaflets one-half inch long, obovate to elliptical and retuse. Peduncles very stout, sulcate and longer than the leaves, six inches long and widely spreading, racemosely six to ten flowered near the apex, pedicels a line long and equaling the bract, stout; calyx tube campanulate cylindrical, two lines long, hyaline, somewhat reflexed, teeth one and one-half lines long and filiform from a broad base, keel moderately arched, surpassing calyx teeth by three lines; faintly pink tipped, narrowed at obtuse apex, wings about equaling the keel and the banner is a line longer and pink. Pods about linear, very acutely beaked, sessile, base pendent and apex erect, the pod being bent nearer the base than apex into a sharp curve so that in some cases the apex touches or surpasses the base, very slightly obcompressed, very slightly sulcate dorsally and occasionally so ventrally, dorsal septum produced so as to make the pod almost two-celled, but not quite. This plant seems to be nearest *A. distortus*, but is quite peculiar. Montezuma Cañon, Utah, June 1, 1892, Coll. by Miss Alice Eastwood.

NEILLIA.

It was my intention to take up this genus later, but in going over my herbarium to fill out some exchanges it has come in my way to study the whole genus.

The recent revision by E. L. Greene has changed the nomenclature considerably.

My method of field study for the last fifteen years has been to collect a large amount of typical material for my sets and exchanges, and to collect for myself from one to five or more specimens of flower and fruit of every deviating form, and to accompany them with such notes as the specimens would not show. I have in this time gathered from a wide field, from Iowa to California, a large amount of material on this and other genera. It early became evident that the characters of Watson's *Neillia Torreyi* as given by himself were valueless, and I sent him a full suite of material showing it, but with his usual persistence he

would not yield. I then decided to take up the genus myself, but lack of time has prevented till now.

I find that the lobation and dentation of the leaves are of little value, also the inflated calyx with connivent lobes, and the shape of the seeds, as well as the pubescence of the pods. The number of seeds in the carpels is very treacherous. The stamens are almost always twenty, in *N. opulifolia* in two ranks and about forty, and the anthers broadly or narrowly oval, the filaments are usually slightly wider at base only and about a line long. The pubescence is always stellate or at least branched in that fashion, but is very variable, and of almost no value. The seeds are always oblique. All the leaves of the genus are three-nerved, five-nerved only by accident.

Taking the order as given by Mr. Greene *N. opulifolia* (L.) Watson, comes first under the heading of "carpels inflated, exserted from the calyx, divergent at apex, bivalvate-dehiscent." The pods are divergent of necessity and are bivalvate-dehiscent a little below the middle to the apex only and not throughout. The range is given as from Canada and Florida to Kansas, while the plant is rather common in Colorado, at least at the base of the mountains on their eastern side at the junction with the Plains. Mr. Greene gives the chief characters as "leaves round-ovate, three-lobed, doubly crenate-serrate, carpels three, four, or five, connate below, one-third inch long, much inflated, usually two-seeded; seeds broadly obovoid."

In my specimens from South Boulder, Colo., collected August 15, 1878, at an elevation of 6000 feet above the sea, and distributed as No. 914, I have one branch with the following leaves on it, one leaf orbicular, not lobed, doubly crenate-serrate; two leaves rhomboidal, lobeless, and doubly serrate as above, base truncate; two leaves rhomboid-ovate, with a very broadly cuneate base, barely three to five-lobed; all the above leaves are rounded and very obtuse at apex; several leaves broadly ovate and barely acute and distinctly lobed above and in other cases below the middle; several others are ovate-lanceolate and very acute and lobed as above. The leaves are from one-half to two and one-half inches long. The pedicels are about an inch long, densely stellate pubescent, the stalk of the stellate hair

very short and the branches very long; calyx densely short-woolly within and without, lobes triangular-ovate and obtuse, a line long, equaling the tube; carpels two or rarely three, flattened, not greatly inflated, very acute, one-third inch long, tips widely divergent, dehiscent a little below the middle, appearing to be glutinous hairy but under the lens vitreous shining and very sparsely hairy with long hairs that are more or less stellate; seeds usually one in each carpel, from ovate to oblong-lanceolate, scarcely a line long and with or without a sharp inner edge, nearly acute, smooth, shining and yellow. Other specimens from the same locality have various intermediate leaves as to serration, lobation, and shape, all showing how futile is the attempt to make a character on the leaves. The venation of all the Neilliæ is really racemose in threes, and not digitate except by accident. On examining a large number of leaves we find that usually the three primary veins come out at the base of the leaf within one-quarter to two lines of each other racemosely, and only rarely exactly opposite, except in *N. monogyna* where it is more common, but this remark as to the racemoseness applies with equal force when there are five apparently digitate veins from the base; in this case the two lateral main veins are branched at base or within a line or two of it. Above the base of the leaf, about four lines, the central vein sends off a pair of secondary veins that are about one-fourth a line to a line apart, and so on. The two lateral main veins branch on the lower side into one or usually two secondary ones, the first near the base, and after that they branch like the main central vein above. The large lateral veinlet is often so near the base of the leaf as to be as near it as the point of separation of the main ones and then is called the fifth vein, but though this can be found in single or a few leaves of a plant it is always less common than the regular form. I have found it on every recognized species of Neillia.

In my specimens from Bear Creek Cañon, near Colorado Springs, the leaves are from rhomboid-ovate to lanceolate, but usually broadly ovate, one inch to three inches long and one-half to two and one-half inches wide; calyx always short-woolly on both sides, cleft two-thirds the way to the base, two and one-half lines long; pedicels glabrous or stellate-woolly;

carpels three to five, barely surpassing the calyx or even five lines long, much inflated and almost cartilaginous when short, shining and very sparsely hairy, or in the larger ones membranous, flattened, inflated much or little, abruptly acute, not greatly divergent, seeds one or more, broadly obovate, one-half a line long, ovary always densely white-hairy. From the above it will appear that the leaf character, length of carpels and shape of seeds are very variable in the oldest species.

Neillia opulifolia (L.) Brewer & Watson, var. *mollis*, Brewer & Watson; *N. capitata* (Pursh), Greene, Pittonia ii, 29.

My material comes from Oakland and from Duncan's Mills, Cal., and was collected by myself. So far as my specimens go the following is true: Leaves broader than in the type, two to two and one-half inches long, and fully as wide or wider, lateral lobes a little larger than in the type, and very rarely is there any evidence of secondary lobes, as is almost always to be found in the other species of Neillia; leaves more pubescent, and more or less cordate at base; carpels vitreous shining, inflated, very sparsely pubescent, shortly acute; seeds lanceolate obovate, incurved or straight; branches not very long nor climbing among the bushes. The corymbs are occasionally proliferous. The only character relied on by Mr. Greene, that of the seeds, proves in my specimens to be valueless, and I cannot see any other good character on which to keep up the species. In some of my specimens at least the seeds are a little narrowed at the apex, but this doubtless is not constant.

Neillia monogyna (Torrey) Greene, Pittonia ii, 30. This is the *N. Torreyi* of Watson, etc., in part. It may be advisable for the present to keep up this species, but there is no necessity for concealing the probable fact that it is only the most reduced form of *N. opulifolia*. No character that has ever been given it holds except the less inflated pod. Mr. Greene puts this under the head of "carpels indehiscent," but they are dehiscent doubtless when fully developed as that is the case with the variety *malvacea* (*N. malvacea* Greene). The form which grows on rocks in Colorado is alone sufficiently distinct, but unfortunately the forms growing on better soil and so better nourished differ. The

starved form I have seen hanging from the cliffs, branching widely and very pretty, and generally growing on rocks and occasionally along with *Jamesia Americana*, a foot or two high. This form is best represented by my specimens from Cheyenne Cañon, near Colorado Springs. The leaves are round and deeply cordate to broadly ovate, always three-lobed above or below the middle, lobes deep in some cases and scarcely recognizable in others, occasionally five to seven-lobed but less distinctly so, three-nerved or five-nerved on the same plant as it happens, digitately (as described in the beginning of this article), half an inch or less long, rather thin and almost glabrous; corymbs in my specimens never proliferous, glabrous or stellate-pubescent, ten to twenty flowered, petals one and one-half lines long and scarcely exceeding the sepals or lobes of calyx, flowers small. Another specimen from the same locality has leaves twice as large as well as flowers, and corymbs compound at base. This differs from *N. opulifolia* only in the monogynous ovary and slightly inflated pod, more incised and less pubescent leaves, and smaller size. Other specimens from the foothills are more robust and the most vigorous leaves are often quite acute and long-ovate. Utah forms seem to be rare. I have never found it in Utah, though I collected a peculiar form in the Schell Creek Mountains, Nevada near the western edge of Utah. This is a low, densely branched shrub with leaves one-fourth to one-half an inch long nearly round and usually cordate at base, always very obtuse, seldom more than three-lobed, but doubly crenate with the incisions very irregular, densely and often ferruginously pubescent on the nerves below and softly so all over, but upper surface less so; flowers very small, three to ten and about umbellate; petals not longer than lobes of calyx which are obscurely lacerate and hyaline on the margins, more so than in the smallest form of the type; stamens about twenty and the alternate ones one-half shorter, the larger ones with much dilated base; anthers oval and as in the type attached by the middle and apparently without a bloom while the type has a decided bloom and is oblong oval; style simply two-lobed at apex. Such marked characters would ordinarily be regarded as specific, but I prefer to call it var. *alternans*, though should

any of the characters given prove to hold, it may bear the name *Neillia alternans*. I fear however that it will prove to be only another of those multitudinous forms that are liable to fall into *N. monogyna* or *opulifolia*.

Neillia monogyna (Torrey) Greene *var. malvacea* (Greene, Pittonia, Vol. ii, p. 31). I have seen the type in the University of California, and recognized it at once as our common Utah form with leaves a little more developed on the sterile shoots, due to the more moist locality in which it was found. This is intermediate between *N. opulifolia* and *N. monogyna*, with the habit of the former as well as the leaves and the pod about intermediate. The calyx is not as large as in one form of *N. opulifolia* from Colorado, the lobes are of the general shape of *N. monogyna* and the calyx of every species and variety is campanulate, the lobes of all the genus would be connivent if the pods did not exceed the calyx, the calyxes of all the genus are tomentose within and without but less so without, the leaves are racemose-digitately (as given above) five-nerved in some of the larger leaves but less so than in the var. *alternans* and but slightly more so than in *N. opulifolia*. The name is not distinctive as the leaves are not so malvaceous as in *N. opulifolia* var. *mollis*. The leaves one-half to two inches long vary from reniform to ovate, lobeless to deeply three-lobed with several secondary lobes, main lobes above or below the middle, teeth minute and very many or large and few; pubescence various and inconstant everywhere except on the calyx; flowers quite large or rather small, with the general appearance of *N. opulifolia* as well as size; carpels generally two, seldom if ever inflated, united to the middle with erect or spreading tips, just equaling the calyx and lobes when well developed, slightly rugulose, shortly but not densely pubescent, and shining beneath the pubescence; seeds three, one generally larger than the others, obliquely obovate or narrower and usually somewhat flattened, as is the case with the genus, outline from the back often broadly lanceolate, smooth and shining, yellow, not larger than in *N. opulifolia* and usually shorter and broader than the var. *mollis*. The pod is dehiscent on one or both sides nearly to the middle at least in many cases though tardily; when not fully mature the pod is indehiscent

and as it is often the case that the full development is arrested by the dry weather, doubtless the majority of the carpels are by necessity indehiscent. The fruit is broadly ovate to rhombic and when the seeds occur above the middle of each carpel then it is oval, but never "orbicular" in any specimen from the Great Basin that I ever saw. The peduncles are always short and like the type. The plant is three to six feet high, grows among other brush, is widely branched and closely resembles *N. opulifolia* in general appearance, but is a little stiffer. It ranges from 7000 to 9000 feet altitude, and prefers the north side of steep mountain sides as there only can it get enough moisture. It is common in the mountains, and I have it from many localities in all stages of development.

Comparing my notes with those of Mr. Greene I find no character left to separate it from *N. monogyna* and only the flattened pod to separate it from *N. opulifolia*, while he gives *N. monogyna* as having a somewhat inflated pod which destroys the last valid distinction.

Watson reports the type *monogyna* as from the East Humboldt Mountains, Nevada, and from Stansbury Island, in Great Salt Lake. I have not seen his specimens, but presume they are the var. *alternans*.

Since writing the above I have found a fine fruiting specimen in my collection from Albuquerque, New Mexico, which belongs to the type of *N. monogyna*. The calyx is much inflated or little so, lobes often emarginate; carpels two or three in each calyx, tips needle-like and widely divergent, carpels separate to below the middle, fully as inflated for their size as the less inflated form of *N. opulifolia* from Colorado described above, or perfectly flat and silique-like, scarcely over half the length of the calyx or one-fourth longer, one to three-seeded, seeds very broadly obovate, scarcely yellow, and angular by being crowded in the carpel, carpels dehiscent and bivalvularly so to the middle. These variances all occur on the one specimen. The only way to uphold *N. monogyna* seems to be that adopted by Gray to keep up Aster, namely by an aggregation of characters no one of which is permanent, but some of which are always present when the others fail.

Prunus demissa Walpers. An examination of all my material shows that the leaves are never less than subcoriaceous and often coriaceous. The flowers are one and one-half to two times larger than those of *P. Virginiana*. The pedicels and peduncles are stouter, but longer. The shape of the leaves varies, but, on the whole, they are narrower, the bloom on the under side of the leaves varies from about the same as that of *P. Virginiana* to almost white in a specimen gathered at Albuquerque, New Mexico. The bark is duller, but otherwise I see little difference. The fruit of both is very astringent. *P. demissa* is a little stiffer than *P. Virginiana* in habit. I am very familiar with *P. Virginiana* as it exists in Iowa, and have abundance of material from there. I am very familiar with *P. demissa* as it exists in Utah, Nevada, Colorado, and New Mexico. All of my specimens from Colorado are *P. demissa*. I distributed them in 1878 as *P. Virginiana*, as at that time all those forms were supposed to be *P. Virginiana*. I doubt that *P. Virginiana* exists in Colorado. My studies confirm those of Mr. Greene, except in a few unimportant particulars, as given in Pittonia under the head of Cerasus.

CYMOPTERUS, SECTION COLOPTERA (C. & R.)

A recent examination of all my material makes it clear that this genus of C. & R. is not well founded. The character given by them in their Revision of the Umbelliferæ, p. 49, is substantially as follows. I omit such characters as are not supposed to be peculiar to the genus.

Coloptera. Involucre none; lateral wings of fruit corky thickened, dorsal filiform. All other characters given belong equally to Cymopterus. The whole genus is really founded on the corky-thickened lateral wings, a character that is also found in other species of Cymopterus in varying degree, but is concealed by the prolongation of the wings beyond the thickened part. This is seen in *C. montanus*, and were it not for the greatly produced edge of the wing it might be taken for a Coloptera, though there is no thin space between the base of the wing and the seed, as is the case in true Coloptera. In *Cymopterus Jonesii* the thickening of the wing is carried to the utmost limit at the base, and is also contracted a little there at the junction with the seed. In *Cymop-*

terus glomeratus the transition is complete. I have specimens collected at Colorado Springs, Colo., whose seeds if taken from the plants would be referred to *Coloptera Jonesii* by the appearance of the wings. This is No. 16 of my Colorado collection of 1878, now distributed widely. In *Coloptera Jonesii* the thickened part of the wing is rather firm ("corky") and varies greatly in thickness, and usually has a thin edge beyond the corky part. In what must pass for *Coloptera Parryi*, from fifty miles south of Lee's Ferry, Ariz., I find the wings much thinner than in *Cymopterus glomeratus*, and most of them with scarcely a trace of thickening, and in none of them would it be noticed by a casual look, but the plant is no doubt a true Coloptera otherwise, the more numerous oil tubes, the minute involucre, and the yellow flowers being the only distinguishing characters. In *Cymopterus globosus* the wings are thickened at the apex as much as in any Coloptera, but they are very spongy and soft. In *Cymopterus megacephalus* the wings at the apex closely resemble *Coloptera Parryi* in the variable thickening. The inconstant thickening of the wings is well shown in *Coloptera Jonesii*, where the dorsal ones are as thin as paper throughout, or nearly as thick as the lateral ones. At other times the dorsal wings are absent altogether, or only a filiform ridge; the shape of the seed is various; often it is very deeply concave, at other times it is scarcely concave; the lateral wings vary much; at times they are contracted around the deeply concave seed so as to form a cup like the variety *cupulatum* of *Echinospermum Redowskii;* at other times they are wide and flat.

Another character relied upon by Coulter and Rose for Coloptera is the absence of an involucre (which is also true of *Cymopterus glomeratus*). Unfortunately they overlooked this involucre in every case except *C. Parryi*, and I doubt not that it is found in that species also if plants fitting their description in every other respect are rightly referred there. In *C. Neaberryi* and *C. Jonesii* I have seldom found it absent, but when it is reduced to a vestige as is often the case it would readily pass for a fold in the top of the peduncle and would lead one to think that the top of the peduncle was fleshy in the green plant, but that is never the case. Under the microscope this is at once

recognized as a hyaline border or involucre. In both of the above species this involucre is one-quarter to two lines wide and often quite evident as much so as in *Cymopterus montanus* the more reduced forms. In *Cymopterus decipiens* the involucre is much more evident as a rule, and in some cases it is as long as the pedicels, that is its lobes which are lanceolate and acuminate and green. *Cymopterus decipiens*, Jones is a true Coloptera, and I doubt not that it will fall into *Coloptera Parryi* eventually as the thickening of the wings is of so little account, while I think that *Coloptera Parryi* will be found to have an involucre as I have described above.

Since there is no character assigned to Coloptera by Coulter and Rose that holds, it must fall into Cymopterus where all its affinities are, where it belongs in habit, structure of the seeds, involucre and involucels. The roots also are those of Cymopterus being deep seated and tuberous like *C. montanus* and *C. glomeratus*. Fortunately this reference will not increase the species nor require much change in names, and in the end will I think reduce all the described species to one. I have not now enough forms to make me feel sure that *C. Newberryi* and *C. Parryi* pass into each other, as many of my apparently connecting forms are without mature fruit. However, the following disposition of the species will hold as far as it goes.

CYMOPTERUS, § COLOPTERA (C. & R). Flowers yellow, lateral wings of seeds thickened in the middle so as to form a ring, oil tubes numerous, involucre usually minute, hyaline.

Cymopterus Newberryi (Watson), *Peucedanum Newberryi* Watson, Am. Nat. vii, 301, *Ferula Newberryi* Watson, Proc. Am. Acad. ix, 145. *Coloptera Newberryi* C. & R. Rev. Umb. 49. Leaves pinnate and pinnæ toothed or lobed, lateral wings only developed. Southern and Southeastern Utah on clayey or sandy plains. Flowers in May and fruits in May and June. Oil tubes 4–8 in the intervals, 8–10 on the commissure. Plate XXV, fig. D.

Var. *alatus*. *Coloptera Jonesii* C. & R., Rev. Umb. 50. Dorsal wings also developed and thin or corky thickened. This shades into the type and is little more than a form of the species hardly deserving to rank as a variety. Frisco and Milford, Utah, in

gravel on mesas. Blooms in May and fruits in June. I alter the name because there is another *Cymopterus Jonesii*. Oil tubes similar but 8–12 on the commissure. Plate XXV, figs. B 1, B 2.

Cymopterus Parryi (C. &. R.) *Coloptera Parryi* C. & R. Rev. Umb. 50. Leaves bipinnate and divisions usually small, involucre absent (?), wings of fruit scarcely corky thickened, and dorsal ones almost equally developed, oil tubes one or two more than in *C. Newberryi*. Northwestern Wyoming, Parry. Plate XXV, figs. A 1, A 2.

To the above is doubtless to be referred *Cymopterus decipiens*, Jones, Zoe ii, 246, but this differs in having a hyaline involucre, though small, corky lateral wings, and well developed dorsal ones. Southeastern Utah, on clayey and sandy plains, growing along with *C. Newberryi*, and seeming to pass into it. It flowers in May and fruits in May and June. Though I first described this as often without an involucre, I find traces of one in every plant in my collection as given above. It would be readily overlooked by almost anyone in most cases.

Since the above was written Miss Eastwood has sent me, from Southeastern Utah, a specimen of undoubted *C. Parryi*, every peduncle of which has an involucre as described above. My surmise was therefore correct, and *C. decipiens* may be suppressed, being a synonym for *C. Parryi*.

In the plate accompanying this article the wings of *C. glomeratus* fig. C, were made too narrow at the apex. Seeds of other species figured are *C. longipes* fig. F, *C. Ibapensis* fig. E, *C. Jonesii* fig. G. The figures are taken from the seeds without soaking them up as that generally swells them out of all proportion and distorts the wings. I have made no effort to show other seed characters beside the wings.

Cymopterus glaucus, Watson. I see that Coulter and Rose in their Rev. Umbelliferæ, p. 81, say that my No. 1688 is this species, but it is not. It is probably *Cymopterus Ibapensis*, but is only in flower. *C. glaucus* is my No. 1687. My numbers never have been duplicated, so it is not necessary to give either the year or the locality of collection, the number tells it all. It is probable that some one has transposed the labels of the two

species in the collections examined. I have one specimen of *C. glaucus*, Watson with an involucre of five, purple hyaline margined, lanceolate bracts as long as those on the involucels.

ZAUSCHNERIA.

Zauschneria Californica Presl. (*Z. latifolia* Greene, Pittonia i, 26.) I am not in a position to discuss the western forms of this species or the species of Zauschneria in general if there be more than one species, but I can throw some light on the eastern forms as I know them well. The form which Mr. Greene calls *Z. latifolia* as described by him does not exist in this region so far as I have even seen, though he gives it a wide range from California to Wyoming and south to Mexico.

The common form in this region has the characters of two or three of his species, *Z. latifolia*, *villosa*, and *tomentosa*, in varying degree. A form gathered at Bingham, Utah, July 20, 1880, and distributed somewhat, but not in my sets, has the petals a line longer than the calyx lobes; stamens exserted two lines longer than petals, and style four lines longer; calyx gradually enlarging from a point about two lines above the base; the base of the calyx is bulbose-enlarged; calyx one and one-fourth inches long; capsule tomentose, stipitate; plant two feet high, erect or bent at base; leaves sparingly villous and with the usual woolly pubescence reduced to a minimum, either of very short, flattened, and burnt hairs or only a papilla where the hair ought to be, but some of the leaves always minutely woolly. It is evident that the woolliness will vary with the climatic conditions under which the plant grows, and is of no specific value. This grows among the cliffs in rocks having a shallow soil, or in crevices.

Another form collected by me at Atla, Utah, in 1879, and distributed by me as No. 1141, grew at an elevation of 8500 feet above the sea on the south slope of the cañon on an almost bare ledge, and, often found by me since in similar situations in the same cañon, is six inches high from spreading decumbent woody stems; leaves short-tomentose and long-villous, lanceolate to ovate, pinnate veined, sparely and shortly toothed; calyx enlarging from very near the base or from a point two lines above it in other

cases; stamens just exsert; capsule clavate, stipitate, sparsely villous and short tomentose; seeds smooth, favose, obovate-oblong.

Another form collected and distributed by me as No. 4270, collected at Bowie, Ariz., September 18, 1884, has leaves narrowly to broadly lanceolate, apparently glaucous, but really minutely tomentose, pilose on midrib and young shoots; two feet high; flowers twice as broad as usual, an inch long and enlarging at a point two lines above the base; uppermost leaves linear lanceolate, entire and very acute; lower leaves sharply and irregularly serrate; capsules glandular-pubescent, short stalked or nearly sessile; calyx lobes triangular and acute, nearly equaling the petals; stamens long or shortly exsert, unequal.

I see nothing in the venation of the leaves that is of specific value in any forms of Zauschneria that I know.

DODECATHEON.

This genus has received considerable attention from Dr. Gray, E. L. Greene, and Mrs. Brandegee. Dr. Gray thought he had found a new character by which to separate species, and E. L. Greene amplified Dr. Gray's species considerably. I am not in a position to throw much light on the Pacific Coast species, and I leave them to others, but I am very familiar with most of the forms of the Great Basin and of Colorado. Mr. Greene, in Pittonia ii, 72, says, under the head of *D. pauciflorum*, "The fruit of this common Rocky Mountain Dodecatheon was not known until I obtained it last year (1889)." This is not correct, as I collected and distributed the flowers and fruit of the Colorado forms in 1878 under my No. 131 in twenty different sets. I again sent them out in 1879 from Colorado. The Utah forms I distributed also in 1880 under my No. 2015. I now have both the flower and fruit of some of my original specimens.

So far as the plants east of the Sierras are concerned I doubt if any of them deserve varietal rank, unless it be one Utah form. Dr. Gray seems to have given the plants of Colorado no attention unless he considers them all to belong to the type of *D. Meadia* L.

Dodecatheon Meadia L. In the fruit retained by me in my No. 131 from Colorado the capsule is broadly elliptical ovate, and a

little surpassing the subulate calyx lobes, hardly acute; flowers many; bracts ovate and acuminate to linear and acute; corolla lobes five, about an inch long, purple; stamen tube a line long or none, yellow as in almost all other forms of the genus, purple ring present or absent; leaves oblanceolate six inches long, short or rather long petioled, entire; scapes twelve to eighteen inches high; whole plant glabrous and glandless, and the leaves not apiculate. Colorado Springs, May 30, 1878.

All the Colorado specimens in my herbarium have acute anthers, and all my Colorado and Utah specimens have the capsule splitting into five valves through the base of the style. There is no trace of an operculum large or minute falling off like a lid, as is the case in my California plants. Nearly all my Utah plants have obtuse anthers that are linear or larger at apex than below, while the opposite is the case with my Colorado specimens.

My other Colorado specimens were collected in Engelmann Cañon, June 14, 1879. They are like the above in the many flowers, bracts, corolla, and calyx, and glabrous throughout, but the stems are two feet high, leaves a foot long, linear oblancelate, or a little broader, almost acute, petiole very short, calyx oblong ovate, and just exceeding the calyx lobes, or on other stems from the same root the capsule is nearly cylindric, being a little broader at the base and one-half an inch long; in other plants from the same place the calyx is cylindric and narrow, one-half an inch long. I have a few specimens from the same locality that have broadly oblanceolate, short leaves with almost no petiole, and repand toothed, few flowers, otherwise as above, but fruit not seen.

My Utah plants No. 2015 have linear-oblancelate leaves, with petiole half the length of leaves, and broadly or scarcely margined, whole leaf two to four inches long; scapes six to twelve inches long; flowers four-merous, purple or light-colored; stamen tube none; calyx lobes subulate; bracts lanceolate to linear and very acute; capsule ovate or urceolate, not quite equaling the calyx lobes, the five valves also notched. The whole plant is perfectly glabrous. Collected at Silver Lake, 9000 feet altitude, July 30, 1880, in American Fork Cañon, Utah. Another plant

collected in City Creek Cañon, near Salt Lake City, at about 7000 feet altitude, on July 13, 1880, has broader leaves, on very long petioles, and the fruit on the same stem varies from ovate to lanceolate, equaling the calyx or surpassing it by two lines. In one pod the valves are ten and in the others five or more. This is in fruit only. In other specimens collected at Lake Shore, on the margin of Great Salt Lake, at about 4200 feet altitude, the leaves are small, two to four inches long, oblanceolate and apiculate, or rarely oval, and in that case long petioled; scapes eighteen inches long, few to several flowered; flowers five-merous, purple, small; anthers only a line to a line and a half long, and broader at the very base, tube half as long; immature fruit inclined to be cylindric.

Specimens from Sprucemont, Nevada, gathered by me on July 11, 1891, have scapes one and one-half feet high; leaves oblanceolate, barely acute, three inches long with petiole equaling blade; capsule ovate-oblong, five-valved, twice as long as the subulate-triangular calyx lobes.

Ample material from Deep Creek, Western Utah, collected June 2, 1891, has scapes one and one-half feet high, stout or slender; umbel twenty-five to fifty-flowered; pedicels one to two inches long in fruit; flowers five-merous, purple, small; stamen tube very short or as long as the anthers; anthers two lines long, with a subulate, purple beginning at base and extending above the middle, tips white as well as the margins, no purple ring; leaves four inches long or less, obovate to oblanceolate, entire, tapering into a petiole which equals the blade or is very short; capsule twice to four times as long as the subulate calyx lobes, nearly cylindric, and as in nearly all other Utah plants shortly acute, five-valved, or in many cases ten-valved.

A fruiting specimen gathered by me at Emigrant Gap, Cal., in the Sierras, July 1, 1882, has the capsule and leaves of var. *ellipticum* K. Brandegee and the anthers and stamen tube of var. *Jeffreyi* K. Brandegee. The bracts are lanceolate acuminate with filiform tips. The capsule is urceolate and a line longer than the calyx lobes.

My specimens gathered at Fall Brook, Cal., March 23, 1882, and distributed in my sets as No. 3398, have a slender scape

twelve to eighteen inches high; leaves one to two inches long, oblanceolate to obovate, quickly contracted into a short-margined petiole, finely and closely laciniate-dentate, thick; bracts and adjoining pedicels glandular pubescent; flowers five-merous, large or very large; anthers small one and one-half lines long and blunt, purple-margined and white in the centre; stamen tube about a line long, and deep purple; bracts hyaline, six lines long and lanceolate acuminate, or oblanceolate, petiolate, and green and leaf-like.

Another form collected by me at Soda Springs, Sierra County, Cal., July 27, 1881, answers to var. *Jeffreyi*, K. Brandegee.

If I were disposed I could certainly make at least three new species out of my material fully as good as any that Dr. Gray has described, but I cannot resist the conviction that there is but one polymorphous species whose separation even into varieties is warranted only by the desire to arrange the forms in some kind of succession.

EREMOCRINUM, nov. gen.

This genus belongs to the Liliaceæ, subtribe Anthericeae, and appears to be nearest to Anthericum, though it has some characters in common with Leucocrinum and Glyphosperma Watson. Perianth rotate, segments three-nerved, white and thin, nerves green; anthers linear, blunt, lobed at base, erect, basifixed and edge to ovary, smooth; filaments linear, broader at base, straight, smooth; slender style elongated, enlarged and capitate at apex; capsule oblong and bluntly lobed, cells apparently two-seeded; pedicels rather stout and jointed near the base; flowers racemose spicate; roots many, long and slender, fleshy, some horizontal; rootstock very short and erect.

EREMOCRINUM ALBOMARGINATUM. This is *Hesperanthes albomarginata* Jones, Zoe, ii, 251. The only change I would make is in the anthers and filaments which I find are not pubescent. I have not yet the mature fruit of this plant. From the first I felt sure that it was a new genus and I withheld it from publication for about a year hoping to be able to decide the matter, but being unable to satisfy myself I finally published it as Hesperanthes, though I knew it did not agree with that genus

nor any other that I knew. The name of Desert Lily will fit this plant perfectly, and this is the meaning of the generic name. The leaves are flat and narrow and not terete as would be inferred from my original description. The pollen grains are large, acute at each end and elliptical. The tip of the anthers just equals the style in flower. Capsule ovate to oval, scarcely crested.

EXPLANATION OF PLATE XXV.

EREMOCRINUM: "A" plant natural size, "B" flower and pedicel enlarged three diameters, "C" pod enlarged four diameters, "D" stamen enlarged six diameters, showing the auricled base of anther, "E" segment of perianth showing nerves, enlarged three diameters, "F 1" cross-section of upper part of leaf, "F 2" cross-section of lower part of leaf.

CYMOPTERUS: "A 1" seed of *C. Parryi* showing wings, "A 2" same with wider wings, "B 1" seed of *C. Newberryi* var. *alatus* without wings on back, "B 2" same with wings developed, one of them corky thickened, "C" *C. glomeratus* with wings thickened as much as in *C. Parryi* one form, "D" *C. Newberryi* with one rib thickened nearly as much as the lateral ones, a common occurrence; "E" *Cymopterus Ibapensis* Jones; "F" *C. longipes* with some of the wings enlarged in the middle after the fashion of the above; "G" *C. Jonesii.* The enlargement of each is shown by the fraction underneath.

NOTES ON THE FOOD OF BIRDS. I.

BY WALTER E. BRYANT.

WESTERN GREBE. *Æchmophorus occidentalis.* The stomach of a young one collected on Merced Lake, San Francisco, was distended with feathers, some of them more than 100 mm. in length. The presence of feathers in the stomachs of Podicipidæ has been observed before and attributed to the individual swallowing them while preening its plumage, but in this instance the bird was in downy plumage, and I may add that feathers alone comprised the contents of the stomach. I have also found a few feathers in the stomach of an adult, which was in poor condition, evidently having been suffering for some time from a gun-shot wound, as algæ were growing to the satiny-white breast as they do to the bottoms of boats. In more than a score of individuals of this species which I have dissected there were found small fishes or nothing.

MALLARD. *Anas boschas.* Four specimens examined from Suisun marshes. *a*. Small univalve shells in gullet. *b*. Bearded barley and barley heads. *c*. Small, sprouted seeds. *d*. Half a teacupful of barnacles in the gullet.

GADWALL. *Anas strepera.* Small seeds and sand in the gizzard.

SURF SCOTER. *Oidemia perspicillata.* The gullet of one shot in the water near the edge of a marsh was so full of small crabs that they fell from the mouth when the bird was picked up. Small crabs and mussels form a considerable portion of the food of this species. I have eaten these birds, but do not care for them often. It is difficult to disguise the peculiarity of flavor.

BLACK BRANT. *Branta nigricans.* All of those which I have examined came from Humboldt Bay, and had been feeding entirely upon "eel grass," or "ribbon grass"—(*Zostera marina*), and were extremely fat.

CALIFORNIA CLAPPER RAIL. *Rallus obsoletus.* In the gullet of a bird shot on a salt marsh, near an artesian well, was a good-sized frog.

NORTHERN PHALAROPE. *Phalaropus lobatus.* A number which were collected from tide pools of a salt marsh had been eating small insects and small worms. Wilson's Phalarope (*P. tricolor*) I have observed catching insects from a muddy surface, actually stalking them in a partially crouching attitude until near enough to dart after them, one at a time.

CALIFORNIA PARTRIDGE. *Callipepla californica.* Two males which I shot one evening, as they were going to roost for the night, after having been feeding on a newly-sown field, contained the following, mainly in the crop: *a*. Two hundred and ten whole grains of barley, six pieces of broken barley, three grains of "cheat," and one of wheat, besides a few barley hulls, some clover leaves and alfilaria. *b*. One hundred and eighty-five whole grains of barley, five broken pieces, four grains of "cheat," and two of wheat; also barley hulls, clover, and alfilaria. The flock numbered nearly or quite twenty birds, and had probably

taken away from that field nearly four thousand grains of barley during that one evening's feeding.

In some parts of California there is a strong prejudice against the quail, owing to alleged damage to the grape. The evidence which I have thus far gathered shows that the quail do pick at the bunches of grapes, and not alone those bunches which are near or on the ground, but the damage which they cause seems over-estimated. Too often, mutilated bunches of grapes are supposed to be due to the presence of quail in the vineyard, but there are other birds and mammals, also, which vary their diet with grapes. I have examined a number of quail's crops and gizzards without finding the presence of grapes, although the birds had been shot near and in vineyards.

A quail's crop sent to me from Los Gatos, by Mr. A. H. Hawley, contained twenty-five small grapes; others had a few grapes, seeds, and poison-oak berries.

Three very young birds of this species contained, besides a few minute seeds, eighteen, twenty-one, and twenty-seven ants respectively. Ants evidently form a large part of the food of the chicks of quails.

The food of quail is mainly small seeds, and at times more or less green food is eaten; clover and the leaves of a species of Baccharis seem to be preferred.

MOURNING DOVE. *Zenaidura macroura.* Small seeds form the principal food of this species according to the crops examined. From one individual collected in Lassen County, I took two-hundred and sixty-seven small pine seeds.

RED-SHAFTED FLICKER. *Colaptes cafer.* Beside the insectivorous food of Picarian birds, the flickers eat largely of poison-oak berries, and I have also found apple in their stomachs.

CALIFORNIAN WOODPECKER. *Melanerpes formicivorus bairdi.* This species is more given to a varied diet than usual with woodpeckers. Besides the fact, which is well known now, that they do eat acorns, various grains are also eaten, and I have known one of these birds to be killed by poisoned wheat put out for ground squirrels. Green corn in the field is eaten and the dry kernels stored away in crevices of trees, as is their practice with acorns.

Several specimens of this woodpecker have been sent to me in the flesh from Visalia, Cal., by Mrs. W. F. Kelsey, in response to my request, as the birds were said to be very destructive to figs. Upon dissection I found the pulp and seeds of figs and nothing else in the stomach. This interesting local instance of injurious habits does not seem to me sufficient ground to justify the destruction of the birds—outside of that orchard. Protection by the use of the shotgun is pretty certain to be enforced by fruit-growers when the actual damage is so evident. I have had marked success in protecting a cherry-tree from the attacks of linnets by suspending a stuffed hawk with out-spread wings over it, and have seen the same plan prove effectual in protecting a soft-shelled almond tree. A stuffed owl is not as effective, acting rather as a "red rag to the bull."

CALIFORNIA JAY. *Aphelocoma californica.* Mr. H. R. Taylor has sent me a corn cob which was entirely stripped of the kernels by jays in Santa Cruz County. Some stomachs collected by Mr. Hawley at Los Gatos contained only barley. Grasshoppers and other insects, principally coleoptera, are the chief dependence of jays, although in a number of instances I have known them to eat acorns and poison-oak berries.

CLARKE'S NUTCRACKER. *Picicorvus columbianus.* At Summit Station Mr. Belding shot one of these birds, from the crop of which I took 130 seeds of *Pinus ponderosa Jeffreyi*, and quite a mass of partially digested seeds was found in the stomach. The crop was so distended that it was very noticeable when the bird was flying.

FLYCATCHERS AND BEES. Mr. A. Barnett, of San Diego County, had 300 swarms of bees which attracted the flycatchers to such an extent that he made some investigations to ascertain to what extent they might be damaging to the bee industry.

Over 100 flycatchers were dissected, principally Arkansas Flycatchers and Phœbes (Black, and Say's?). In all of the Arkansas Flycatchers drones were found, but no working bees, although in many cases the birds were gorged. In most of the Phœbes drone bees were found, the only exception was that of a

Phœbe (Say's?) in which a bee's sting was found in the base of the tongue.

The birds were all shot about apiaries and were seen darting upon and catching the bees. The examinations were made with a hand lens. Mr. Barnett regards the occurrence of the sting found in the Phœbe as accidental and concludes that Flycatchers are beneficial in reducing the number of drones.

* * * * * * * * * *

Since the foregoing notes were written I have received an excellent and timely work by Dr. A. K. Fisher on The Hawks and Owls of the United States in their Relation to Agriculture, and which in itself is so complete and conclusive that I may withdraw the meagre notes which I have made upon rapacious birds; they only confirm the conclusions of Dr. Fisher that most of the hawks and owls are far more beneficial than injurious to the agricultural interests of the country. The microscopical examinations, so far as I made, of the contents of the stomachs of the small land birds of California; are vastly in favor of the desirability of protecting them all. A few local instances where actual damage has been done, notably in fruit orchards, must not be taken as a criterion of the value of the species throughout the State and throughout the entire year.

THE HOPKINS SEASIDE LABORATORY.

With Plate xxvi.

BY O. P. JENKINS.

The necessity for seaside laboratories for advancement in biological science has been thoroughly discussed and practically settled.

In Europe the conclusions of this discussion have been more extensively accepted and acted upon than in this country. Within the past twenty years a large number of such stations have been established on the coasts of the various countries of Europe. Of all these the most famous on account of its magnificent equipment both in appliances and in a very complete library, as weli as for the grand results which have followed its

establishment, is the Zoological Station at Naples. The success of this great institution is due to the enthusiasm and ability of its founder and director, Dr. Anton Dohrn. This institution has been often described, so that something of its work is very generally known. But it is not well known that in Europe there is a large number of well-equipped and well-supported seaside laboratories. It is from these laboratories that the most important biological work of the present time is issuing.

In our own country the history of the seaside laboratory, while it contains some noteworthy undertakings and bids fair to have a brilliant career, is more briefly told. All naturalists are perfectly familiar with the first notable step in this direction made by Louis Agassiz at Penikese. The natural impetus which came to American biological studies from the inspiration engendered by this movement can never be overestimated. Since the death of Agassiz and the closing the school at Penikese, other very successful laboratories have been maintained on the Atlantic Coast, the results of which have been of great value to biological science. The most important and successful of these thus far have been those of the Marine Biological Laboratory and the Laboratory of the U. S. Fish Commission at Wood's Holl, Mass., and the one maintained by the Johns Hopkins University, which has been moved from point to point. Popular accounts of these have appeared at various times. The Marine Biological Laboratory, under the direction of Dr. Whitman, has been especially successful. It has developed very rapidly into a place where a considerable number of biological investigators with a large number of students assemble every year both for research and elementary study. This station is already regarded justly as a very important one and it contributes largely to the current of biological thought in this country. The commendable ambition of its eminent director, if backed as it should be, and no doubt will be, by proper financial support, will make the station at Wood's Holl even more a center for biological research than it is at present.

With all this activity in biological study pursued by modern methods, there is every reason why the splendid advantages of the Pacific Coast should be made to contribute to the progress of

the work. From the moment that the Leland Stanford Junior University proceeded as far in its organization as to have its first nucleus of a faculty appointed, the biologists of that number began to form plans for the establishing of a marine biological station somewhere on the coast. As soon as time from the work of forming new departments could be secured, Professors Gilbert and Jenkins began a search for the most desirable location for such a station. These examinations were carried on quietly, so that no outside influences might be brought to bear to change the choice of a location; the desire being to select a situation wholly on its merits as a suitable place for such a laboratory.

The points taken into the consideration in this selection were first, the natural advantages, then accessibility; and the facility of getting accommodations at which those engaged in the work could pleasantly and conveniently live.

The present location at Pacific Grove was the result of this selection. When it became public that such an institution was to be located on the coast, expressions indicating the most liberal spirit on the part of towns and citizens were volunteered. This shows that the enterprise has been started in a country where exists an intelligent and liberal people, who will not let it suffer for want of financial support.

The highest hope of those who have undertaken the enterprise was to make a very modest beginning and allow the Laboratory to develop by a process of growth, but with the full faith that the humble beginning would soon lead to a more pretentious development.

As soon as the site was selected, the town of Pacific Grove and the Pacific Improvement Company showed towards the proposed Laboratory a liberality which placed in the hands of the directors sufficient land and a considerable sum of money with which to begin operations. Mr. Timothy Hopkins soon took a great interest in the Laboratory and became its principal benefactor. In recognition of his hearty support and great interest in its establishment, the institution has been christened the Hopkins Seaside Laboratory.

With the financial support thus given it, the directors, last

spring, erected a laboratory consisting of a plain wooden structure of two stories, sixty by twenty-five feet.

It is located on the coast near the railroad station just next to what is known as "The Point," or Point Aulon. On the first floor are two general laboratories for elementary students, a storeroom and a library room. On the second floor is a third general laboratory and six private laboratories for investigators. The laboratories, both general and private, are furnished with aquaria, which are supplied with running sea-water. The sea-water is obtained from a source which allows it to be perfectly pure. The water is pumped by a gasoline engine to a tank from which the supply is distributed. The Laboratory is also abundantly furnished with excellent fresh water. The Laboratory possesses a very full supply of glassware and reagents. Whatever is needed in the way of microscopes, microtomes, embedding apparatus, and physiological apparatus is taken from the laboratories of Leland Stanford University for the summer. Of this supply there is a good stock to draw from. The Laboratory also possesses a limited amount of collecting apparatus and two boats.

Monterey Bay being a fishing station of considerable importance renders it possible to make use of many outside advantages for collecting.

The session of last summer was under the direction of Dr. C. H. Gilbert, Professor of Zoology, and Dr. O. P. Jenkins, Professor of Physiology and Histology of Leland Stanford Junior University. They were assisted by Mr. F. M. McFarland, Instructor in Histology, Mr. C. W. Greene, Assistant in Physiology, and Mr. B. M. Davis, Assistant in Botany in the same institution.

Seventeen students were in attendance, representing some half dozen States and several institutions of learning.

The experience of this, the first season, demonstrated clearly enough that the choice of the location is a fortunate one in every way. The forms of plants and animals are wonderfully rich in variety, in the numbers of individuals, in interest, in novelty, and in accessibility. It proves a perfect paradise for the marine biologist. Of course, a single season has only served as a beginning toward opening the gates to the treasures here to be gathered.

The size which some of the forms reach, while of less scientific interest than other of their features, renders them astonishing to those accustomed only to Atlantic forms. A species of Holothurian was brought in three feet in length, jelly fishes two feet in diameter, sea anemones which when open were eighteen inches in diameter, chitons, the giants of their race, twelve inches long, keyhole limpets that would weigh two pounds. Great chains of Salpæ were obtained. The fishes of the bay are of great interest. Among the most common forms are various species of the surf fishes, of great interest from the fact that they bring forth their young alive.

Occasionally the bay is enlivened by the presence of whales, shoals of grampus and dolphins, and seals. But the character of this sketch will not permit an account of the life of the coast at this point, of the interesting land fauna and flora, and the beautiful scenery along the whole coast.

The Hopkins Seaside Laboratory while carried on under the auspices of the University is by no means to be regarded as simply a provision for members of that institution. Its advantages are planned for and freely offered to investigators from whatever source. In this work it is not to be at all looked upon as a rival to any of the well-equipped laboratories already in existence, but rather as a colaborer with them. The field it occupies is both unique and important. It would be a serious neglect of biological opportunities to leave it longer unoccupied. The problems which are now present on this Coast, and those which will open from time to time, will attract investigators from other regions. There is now a home provided for them.

Those of this coast engaged in biological study it is confidently expected will take a lively interest in the work of the Laboratory.

There is no field in science more inviting, nor more promising of large results, than those pertaining to the morphology and physiology of marine forms. The time has certainly arrived when those among us with scientific inclination and ambition can turn their attention with profit to these inviting fields. The work of the Laboratory thus far provides for three classes of people. Naturally students in the biological departments in the

University wish to extend their work in the Seaside Laboratory. They are made welcome. Besides these the Laboratory is open to teachers or those especially interested or prepared to carry on biological study. Especial welcome is given to investigators, those well trained in such work, who have problems relating to morphology or physiology of marine plants and animals which they are capable of working out. Among this class no doubt in time many eminent biologists will take their place. From the association and influence of such a class of men, biological study on the Pacific Coast will receive great gain. The teachers of biological science of the colleges and high schools of the Pacific Slope States should in time find in the Hopkins Seaside Laboratory what those of the Atlantic States find in the Marine Laboratory at Wood's Holl.

It is very obvious that to maintain such a station will require no small sum of money. But such important work and so well begun will not lack support. And most certainly the united moral support of those of the Pacific Coast States who are interested in the advance of science in general, and of biology in particular, may be most confidently counted upon.

THE BOTANICAL WRITINGS OF EDWARD L. GREENE.

BY KATHARINE BRANDEGEE.

It has perhaps not escaped the notice of the botanical world that there is a very great difference of opinion in certain points, especially in the number of species belonging to the Californian flora, between Mr. Greene and his pupils on the one hand and nearly all the remaining Western botanists on the other. Some explanation of the causes of this difference may be of interest.

All of Mr. Greene's work tends to the inordinate multiplication of species, and his species are, as a rule, so imperfectly described that no one without a close acquaintance with the flora or access to the types is able to make out his meaning. It seems to suit his convenience, wherever there is the slightest ground for difference, to at once describe a new species as vaguely as

possible, both as to character and station, and leave to others the unhappy task of finding out whether it is admissible or not. It is a well-known fact that genera and species can be launched with great ease, and that the process of disproving them is onerous and thankless, the more so as the distant investigator naturally defers somewhat to the one who is supposed to have intimate knowledge of the living organism, and possibly to find differences which are masked in the dead one.

Mr. Greene has described "as new" about 700 species, and resurrected something like the same number of groundless synonyms, nearly all relating to the Californian flora, and thus adding to our already inflated list at least 1000 names. It is safe to say that not more than one in ten of these species is tenable, and probably one in fifteen or twenty would be nearer the mark.

In his earlier work, when he submitted his proposed species to the judgment of Dr. Gray or Dr. Watson, the proportion was much better, though the lapse of time and increasing knowledge of connecting forms is dealing hardly with many of those, and he has not escaped the suspicion of deliberately selecting the extremes and ignoring the intermediates.

The underlying reasons of Mr. Greene's devotion to "new species" are not far to seek. The most important one is his attitude concerning their origin. He openly contemns, as inconsistent with the Mosaic record, the theory of evolution held in greater or less degree by almost all biologists, and proclaims his belief in the special creation and the fixity of species, taking occasional opportunity* to sneer at the misguided mortals who differ from him. How this belief affects his botanical teachings is evident at once. Rejecting the clue which would lead him through the tangled labyrinth of overlapping forms which so especially abound in the extreme variation of environment found on the western coast of North America, nothing is consistently left to him but to make a new species of every variation, no matter how trivial. That he has not made five times as many is

* "And if so is it another of that class of facts which our friends the evolutionists press into service, as indicating that species, and even genera, are created by soil, climate, or in one oft-repeated word, environment?"

due to his really, in spite of frequent claims to the contrary, slight knowledge of the forms belonging to our flora, especially in view of the following presentment of his idea of the distinctions of species. "I have long been of the opinion that many species exist in nature for which no specific characters can easily, or even by any known criterion, be found at all in the perfectly developed individual plant; in other terms that completely and thoroughly distinct species may, and in some cases do so closely simulate each other that, with ordinarily good specimens before him, the most acute botanist will fail to be able to separate even as varieties." *

Mr. Greene herein makes it perfectly evident that a species is not with him as with most of us a form of life with characters sufficiently and constantly different from others to admit of a clear description and with a name conveniently expressing relationship, but a distinct entity not necessarily in any close relation to other forms now or previously on the earth and to be hunted to its remotest lair properly labeled and put away on shelf for all time. This kind of botany was taught, probably, in the middle ages to which Mr. Greene properly belongs.

The specific descriptions of Mr. Greene are a disgrace to botany. Even in the few instances where he has named valid species—and in such a multitude it sometimes happens—he uniformly fails to grasp the salient points and mistakes most of the rest. Some of these errors are so gross as to be, for a man holding the position of the author, almost inconceivable, and leave the reader to choose only between deliberate misstatement and an ignorance of methods of scientific study unparalleled in a Professor of botany of a modern university. It is, indeed, to be suspected from his descriptions that, though he can write learnedly of embryological observations made by others, his only method of getting at even the cotyledons of any seed smaller than a bean, is to sprout it. In the very few instances where he has ventured to write about the ovules or embryo, his attempts have been fraught with disaster, as in Viscainoa† for instance, where with a seed of considerable size he described the embryo as

* Pitt. i, 298.

† Pitt. i, 163, 208.

"very small at the base of a copious hard-cartilaginous or almost corneous albumen; cotyledons rounded somewhat convolutely enfolding the short blunt radicle" the fact being that the cotyledons were as long as the seed, and did not enfold anything. Although he had the courage to found a genus upon this plant, he had no conception of its relationship, and sometime subsequently put this near relation of Guaiacum next to Simmondsia, in his list of the plants of Cedros Island.

In declaring Syrmatium* Mr. Greene says: "In restoring this long-neglected genus, I am not obliged to rest it upon those characters alone, sufficient although they would seem to be, which were indicated both by Vogel and by Nuttall a half century ago. The indehiscent pods promptly deciduous at maturity are so utterly and widely unlike those of any *Hosackia* that I suppose the character being here pointed out, there will henceforth remain less excuse than formerly for confounding the genera." Subsequently in working over the genus† he found himself able not only to reduce Syrmatium to Hosackia again, but Hosackia itself to Lotus, remarking that "since the jointed pedicels and deciduous fruiting calyces of, for example, the Lagopus subgenus of Trifolium are not to be of generic import, neither may they be so treated in this group of Lotus which has been called a genus under the name of Syrmatium. The indehiscence of the pods is not at all confined to this group of species. In the very type of the Hosackias and in all its near allies the dehiscence is so tardy that they may about as well be described as indehiscent."

In Pittonia ii, 292, he devotes some space to the fruit of Garrya, which according to his account he has just seen mature for the first time. He is astonished that great botanists like Lindley, Endlicher, and Bentham should have been so greatly mistaken as to consider the fruit a berry "when the first glance at these clusters revealed the fact that the fruit is not baccate, but capsular and the capsule has a circumscissile dehiscence. * * * The circumscission of the capsule is neither very prompt, nor in a geometrically perfect circle, but if tardy and

* Bull. Cal. Acad. ii, 145.

† Pitt. ii, 137.

slightly irregular, it is still an unimpeachably circumscissile dehiscence."

The fruit of Garrya, "pyxis" Mr. Greene calls it, is what is known to most botanists as an "indehiscent berry." It is in fact about as dehiscent and in just the same manner as a gooseberry, Both of them have their tissues strengthened at base and apex and when subjected to violence burst irregularly along the line of least resistance, but if preserved from violence and decay neither of them would "dehisce" in a thousand years. He discourses learnedly concerning *Cicuta Californica* and its root character* but some kind friend having pointed out his blunder he is obliged to admit† that he had mistaken *Œnanthe Californica* for Cicuta and that his remarks do not apply; nevertheless undismayed he proceeds to separate, on root characters alone, three new species from *C. maculata*—he thinks one of them may be *Sium Douglasii*, but not being certain takes his usual and easiest method—makes a new species.

He insists upon dismembering the Compositæ, separating the Cichoriaceæ‡ which he considers more closely allied to the Lobeliaceæ than to their present companions—making the possession of a milky juice of more importance in classification than details of structure. It is a relief to find that he does not drag Asclepias, Papaver, Euphorbia, and the Cow tree into the partnership.

His devotion to archaic botany seems to interfere somewhat with a due regard to contemporary literature, as, for instance, in his lengthy account of Carpenteria, § where he made the rest of the world aware that he thought a plant in quite common cultivation was still known only in the type specimen; in his rather frequent homonyms and in such instances as *Eriogynia Hendersoni*|| and *Cnicus heterolepis*,¶ both of which he redescribes, being "unable to find that any description was ever published," though the first appeared in the *Botanical Gazette* for 1891, and the second (under Cirsium) in *Plantæ Hartwegianæ*.

---

* Pitt. i, 271.

† Pitt. ii, 6.

‡ Pitt. i, 298. Erythea, i, 1.

§ Pitt. ii, 67, 141.

|| Pitt. ii, 219.

¶ Proc. Philad. Acad., 1892, 363.

Mr. Greene's memory is apparently often at fault in such trivial matters as may involve the giving of credit to others, especially to those who have rendered themselves obnoxious by presuming to differ from him. A few instances have already been pointed out.* Among more recent lapses may be mentioned the rediscovery† of *Sanicula maritima* by Miss E. Cannon. Mr. Greene not long ago gave an account of it and its only known locality, ‡ but in "Flora Franciscana" writes of it as if it were not uncommon, and makes no mention of the recent collector.

That he should remember to quote his neighbor's synonymy and forget his own is perhaps quite natural, but it may have a misleading effect upon the "tyro," whom he so frequently mentions. *Cleome Isomeris* Greene of Pittonia i, 200, does not reappear in "Flora Franciscana," neither do the various species of Atenia, of which he is the author, and of *Trifolium triflorum* no trace appears.

The author of a local flora is supposed to have a good acquaintance with the plants of his region, but Mr. Greene's knowledge of "his own western hills" is not by any means exhaustive, judging by the three parts of "Flora Franciscana" now issued. A few examples taken at random from the multitude may suffice. He evidently did not know that *Roubieva multifida* covers large areas in San Francisco, and is widespread about the interior towns; that *Chorizanthe polygonoides* grows at a convenient walk from his door; that *Silene multinervia*, *Calandrinia Breweri*, *Claytonia parvifolia*, *C. diffusa*, and *Astragalus Breweri* abound on Tamalpais; that *Cypselea humifusa* and *Glinus Cambessideus* share the muddy margins of pools with "Biolettia;" that *Crantzia lineata* abounds along the river and slough banks from Antioch to Port Costa; that *Cleome integrifolia* is abundant a few miles below Monterey; that *Abronia villosa* is found in the valley of the San Joaquin at least as far north as Alcalde; that *Lotus stipularis* "seldom seen" is common on ridges of Tamalpais and on Redwood Peak in his immediate neighborhood; and that *Euonymus occidentalis*, "apparently one of the rarest

---

* Proc. Cal. Acad., ser. 2, i, 259. Zoe, ii, 80.

† Zoe, ii, 95.

‡ Pitt., i, 269.

of our shrubs," is found in every deep, shady ravine of Tamalpais. By his two synonyms he has made it sufficiently evident that he never saw the red-berried elder, although it grows in Wildwood Glen at Sausalito, and is quite common all about Marin County. By his own confession he has just seen for the first time ripe fruit of a Garrya, although two species fruiting abundantly help to make the thickets covering Tamalpais, and he has written, as of distant plants, pages in his usual didactic style, attempting to convince the world that the black- and the amber-fruited forms of *Ribes aureum* are two distinct species, ignorant of the fact that Dr. Kellogg long ago reported it as growing in "Redwood Cañons, back of Alameda," and that it fruits abundantly in both forms in San Antonio Valley, back of Mt. Hamilton, and with no more reason for division than *Ribes spectabilis*, which fruits with similar diversity at Point Reyes.

His descriptions in "Flora Franciscana" are usually quoted, and the attempts at critical work are of the weakest—as for instance where dealing with species well known to him in the living state, he calmly inserts into his flora *Vicia gigantea* and its strict synonym *Lathyrus cinctus*, and *Lupinus cervinus* with its second name *L sericatus.*

But it is when Mr. Greene enters the field of bibliography and attempts to fix the dates of genera and species that his work stands forth unrivaled. As long as he confines himself to copying from the pages of Pritzel, Jackson, etc., and from Watson's Index he is tolerably secure, but when grown bolder he cuts himself loose and starts on his wild career alone, then chaos comes again.

Everyone knows that the dates given on the title page of many of the botanical books even as late as forty or fifty years ago are inaccurate. The importance of exactness was yet little felt, and priority was not so much regarded. Between the years 1830 and 1846 three English works of much importance to our flora, were published. These were Flora Boreali-Americana in two volumes, Botany Beechey, and Botany of the Sulphur. The first bore on title page the date 1840; the second 1841; and the third 1844. The last concerns us at present but little and may be dismissed with the statement that it was evidently

antedated as it quotes the London Journal of Botany for 1845 and De Candolle's, Prodromus, vol. ix, also of 1845.

The two first were apparently printed nearly simultaneously. They alternately quote from each other beginning with the California part of Botany Beechey, and continuing in something near the same order to the end.

Mr. Greene adopts ostensibly the dates given in all the lists, 1833 for the first volume of Flora Boreali-Americana; 1840 for the second volume and 1840 for the whole of Botany Beechey.

The internal evidence shows that these two publications were printed in irregular parts or signatures at irregular intervals. Flora Boreali-Americana, is quoted in Don's Dichl. Plants, commencing near the beginning of vol. i, dated 1831, and as Don's volumes are of 700 or 800 4to pages, which, on account of the precision required, would take a long time to print, the evidence is sufficient to show that the first parts of Flora Bor.-Am. must have been printed, and to a certain extent distributed early in 1831. These books all followed the same classification, which interferes considerably with the definiteness of dates. Vol. i of Don quotes to Violaceæ; Vol. ii, 1832, quotes as far as its classification goes—page 214 of Flora Boreali being about the last.

Flora Boreali-Americana commences on page 247 to quote Botany Beechey, page 124.

In the light of these data the following dates affixed to the species by Mr. Greene will show how little he is to be trusted, and what a hopeless muddle he has made of the whole matter. They are copied unless otherwise stated from his Flora Franciscana.

Anemone deltoidea,	Flor. Bor.-Am. i,	page	6	(1829).
Pæonia Brownii,	"	"	" 27	(1829).
Erysimum capitatum,	"	"	" 38	(1829).
Physaria didymocarpa,	"	"	" 49	(1829).
Cakile edentula,	"	"	" 59	(1830).
Hesperis Menziesii,	"	"	" 60	(1830).
Platyspermum scapigerum,	"	"	" 68	(1829).
Thysanocarpus curvipes,	"	"	" 69	(1829).
Cleome lutea,	"	"	" 70	(1830).

Viola sarmentosa,	Flor. Bor.-Am. i, page		80 (1833).
Psoralea physodes,	"	"	" 136 (1830).
Astragalus lentiginosus,	"	"	" 151 (1830).
Vicia gigantea,	"	"	" 157 (1830).
Cerasus emarginata,	"	"	" 169 (1830).
Spiræa Douglasii,	"	"	" 172 (1830).
Œnothera Boothii,	"	"	" 213 (1833).
Hosackia tomentosa,	Bot. Beech.		" 137 (1836).
Adenostoma fasciculatum,	"	"	" 139 (1840).
Œnothera alyssoides,	"	"	" 340 (1840).
Godetia lepida,	"	"	" 342 (1836).
Gaura decorticans,	"	"	" 343 (1840).
Œnanthe (Helosc.) Californica,	"	"	" 142 (1840).

As if this kind of thing were not ridiculous enough he gives the following:

"*Sanicula arctopoides* H. & A.; Hook. Fl. i, 258 t. 90 (1833); Bot. Beech. 141 and 347 (1840)."

"*Sanicula Menziesii* H. & A.; Hook. Fl. i, 258 t. 90 (1833); Bot. Beech. 141, 347 (1840)."

As both of these species are quoted on page 258 of Flora Bor.-Am. from 'Hook. et Arn. in Bot. of Beech. Voy. p. 141" for the first and page 142 for the second species, Mr. Greene deliberately commits himself to the theory that Hooker in Flor. Bor.-Am., published in 1833, was able to prophesy on what page of a work published seven years later a given species would appear.

Rees' Cyclopædia is in thirty-nine volumes of text with several of plates. Every one of the volumes of text bears on its title-page the date 1819. They follow each other in the order of the alphabet, and are not paged. Mr. Greene appends certain dates to the species quoted. How he arrived at them he can best explain. The following are examples. The words in brackets are by the writer:

Achlys triphylla Smith, Rees' Cycl. (1812?) under *Leontice* [vol. xx].

Phaca densifolia Smith in Rees' Cycl. (1819) [vol. xxvii].
Ribes malvaceum Smith Rees' Cycl. xxx (1815).
Ribes ferox Smith Rees' Cycl. xxix (1815).
Ribes stamineum Smith Rees' Cycl. (1815). [Smith's paper on Ribes is eight pages in length, and entirely in Vol. xxx.]
Viola adunca Smith Rees' Cycl. (xxxvii) 1817.

These are but examples of numerous others, a few of which will be noticed in subsequent pages, and yet, Mr. Greene, as is well known, poses as bibliographical purist, and is remarkably fond of pointing out the shortcomings of others in this respect.*

The genera proposed by Mr. Greene are, with the notable exception of "Biolettia," founded on sections of other authors, on aberrant species to which attention had been called by others, or as substitutes for older names which he considers untenable. The changes made by the resurrecting of synonyms and the rejection of homonyms are of much greater extent and made as most of them are without judgment or sufficient research have inflicted an appalling synonymy upon the Flora of California.

The principal generic changes so far made or adopted by Mr. Greene in his Flora Franciscana and other papers, are:

Clematitis L. instead of *Clematis* L. This is one of the changes in which Mr. Greene follows Otto Kuntze. It is effected by taking as the Linnean date the first edition of the Systema Naturæ, two years earlier than the period commonly received. The additional syllable in the name seems the only thing to be gained by this transfer.

Kumlienia, Greene founded on *Ranunculus hystriculus*, principally on the utricular akenes, though they are hardly more utricular than in *R. Nuttallii* or even in the common *R. Cymbalaria*.

Chrysamphora, Greene for *Darlingtonia* because there is an older Darlingtonia in synonymy. As, however, the "once a

* The latest of these diatribes is to be found in "*Erythea*" for May, 1893, where the author, in the course of "damning with faint praise" Professor McMillan's Metaspermæ of the Minnesota Valley, says, "We might have expected much of bibliographical laxity and inaccuracy in any author who could speak of Watson's Index as being a book 'remarkably exact.'"

synonym always a synonym" rule has not been adopted as yet by any considerable number of botanists no one need be in haste to discard the well-known name. It must not be forgotten that many generic names are retained in deference to usage, though hardly considered valid, and that if change is insisted upon some at least are likely to be merged in their nearest neighbors. The differences between Darlingtonia and Sarracenia are very slight.

Alsinella Dill. is taken up for *Sagina* L. in violation of all botanical rule.

Tissa Adans. is adopted instead of *Spergularia*, *Lepigonum* or *Buda*. The best way out of this tangle is, in the writer's opinion, to remand the few valid species to *Spergula* from which some of them can hardly be distinguished.

Bursa L. for *Capsella* Moench. If the proposition emanating from a group of German botanists, and adopted by the botanical section of the American Association, meets with general acceptance this change will not be required.

Heterodraba Greene is *Draba unilateralis* Jones. It differs in habit, but not in technical character from other Drabas. It is a singular botanical judgment which sustains Heterodraba and Tropidocarpum, while reducing Stanfordia to Caulanthus.

Athysanus Greene was founded on *Thysanocarpus pusillus*. The author seems never to have been able to get at the details of its structure. The depauperate strap-shaped petals, and membranaceous filaments widened toward the base are as in *Draba unilateralis*, but the pod, which in San Francisco specimens is often destitute of hooked hairs, is constantly 1-celled, 4-ovuled and 1-seeded. The Cruciferæ are badly in need of a general revision. In their present state no botanist adds to his credit by proposing new genera among them.

Hesperalcea Greene is one of Dr. Gray's section names raised by Mr. Greene to generic rank. As Sidalcea is itself becoming much weakened it would seem hardly necessary to erect one of its species into a separate genus.

Toxicodendron L. for *Rhus* L. A Systema name.

Lotus L. for *Hosackia* Benth. With this we agree.

Xylothermia Greene for *Pickeringia* Nutt. On the "once a

synonym always a synonym" plan. The fruit of Pickeringia seems to be so far unknown and may alter its place in classification. The pod is from 1½ to 2½ inches, 5–9-ovuled, 2–4-seeded, flattened, constricted between the seeds, but not jointed, dehiscent along the ventral side; seeds with thin foliaceous cotyledons, and rather abundant endosperm.

Viscainoa Greene had long been known as *Staphylea? geniculata* Kell. Everyone knew that it did not belong to Staphylea, but as only old fruiting specimens were known, no one but Mr. Greene ventured to give it a new name. It is one of a series of monotypic or restricted genera all very near Guaiacum.

Mr. Greene divides Prunus into Cerasus, Prunus, and Amygdalus; adopts Sorbus instead of Pyrus and separates Malus. All this has been done before and rejected.

The separation of Spiræa into a half dozen or more genera will commend itself to such botanists as appreciate very fine distinctions and take pleasure in a complicated synonymy. One of these genera, *Eriogynia*, deserves some notice. Mr. Greene says:

"I had long suspected that Bongard's paper on the vegetation of Sitka, read in the St. Petersburg Academy on the fourth of May, 1831, must have been printed and distributed before 1833; in which case it would antedate much of the first volume of Hooker's Flora. Dr. Otto Kuntze's careful and extensive researches into bibliography have brought forth the fact that Bongard's paper was indeed distributed before the end of 1831. It is therefore inevitable that LUTKEA must displace Eriogynia."*

Otto Kuntze as his authority for the earlier date of Bongard says that, according to a statement of De Candolle, Bongard's paper had been already noticed by him in 1831.

It has already been shown on a previous page that a large part of the first volume of Hooker's Flora, Bor–Am. was quoted by page and plate in volumes issued in 1831 and in 1832.

It is a fact which seems to have escaped the notice of Mr. Greene, that contemporary botanists, even those who would apparently be the first to know, make no such claim; for instance, Walpers Repertorium ii, 53, published in 1843, quotes Bongard

* Pitt. ii. 219.

Pyrus diversifolia as a synonym of Hooker's *P. rivularis*, Flor. Bor–Am. i, 303.

Maximowicz, of St. Petersburg, who might be supposed to know the date of a Russian work, says in Adn. de Spiræaceis: "Names [Eriogynia and Lutkea] by Hooker and by Bongard published in the same year, the latter perhaps earlier, but Hooker's preferred because the specific name is correctly given."

Osmaronia Greene for *Nuttallia* T. & G. "Once a synonym always a synonym." Nuttallia is, however, easily reducible to Prunus.

Kunzia, Spreng for *Purshia* DC. for the same reason.

Micrampelis Raf. for *Echinocystis* T. & G. Rafinesque's names should not be received until his diagnoses are republished. Many of his papers are almost inaccessible, and before submitting to the changes involved in the restoration of his names, the botanical world should have the means of judging whether they deserve to be resurrected or not. Mr. Greene is notoriously partisan, and a strong partisan is never a just judge.

Osmorrhiza Raf. is reduced to *Myrrhis* Moris. The former is as good a genus as most of those at present accepted in the family. Any reduction in their number is, nevertheless, to be welcomed.

Lilæopsis Greene for *Crantzia* Nutt. "Once a synonym," etc.

Caprifolium L. for *Lonicera* L. Systema name.

Obolaria Sieg. for *Linnæa* Gronov. Before the Linnean date.

Trichocoronis Wrightii, Gray, a small Eupatoriaceous plant now becoming naturalized in California having been discovered by one of Mr. Greene's pupils, was described by him as a new genus and species *Biolettia riparia*, Greene, which according to him "has the aspect of a small Erigeron but with fruit characters of the Helenioideæ * * * suggests at once Eclipta and Spilanthes." Having had his error corrected by the writer* he after the lapse of a year attempts to evade the matter in the following way, which at the least can hardly be encouraging to any one wishing to believe the author's blunders to be inadvertent.

"TRICHOCORONIS a small group of flaccid riparian herbs, though perhaps best placed here, imitates *Erigeron* of the next

* Zoe ii, 301.

tribe in general aspect, and lacks even the clavate style-branches of this one, these organs being nearly linear and even somewhat compressed, rather than terete and claviform. Although the type of the genus has pentagonal achenia and a coroniform concreted pappus, a newly discovered Californian ally of it displays exactly quadrangular akenes surmounted by distinct and conspicuous pappus paleæ and equally distinct bristles alternating with them. This I have published as a genus *Biolettia*; and, with authors who, like Bentham and Asa Gray, make much of this kind of character, allowing it to overbalance all considerations of agreement in habit, *Biolettia* will be received in generic rank. But, as the type is a *Trichocoronis* in *facies* I now prefer to treat it as an aberrant member of that genus, and rename it:

TRICHOCORONIS RIPARIA. Biolettia riparia, Greene, Pitt. ii 216."*

Mr. Greene should call this kind of thing Comical Notes instead of "Critical Notes." "Biolettia" has been distributed to a considerable extent and any one who has a specimen may see for himself that the style branches are terete and somewhat thickened upward, and that the pappus is exactly what Dr. Gray describes "a minute but evident crown of more or less concreted setuliform squamellæ or some of them aristellate." The akenes are always pentagonal though the faces are unequal. Bentham and Hooker say "In specie altera (*T. Wrightii*) styli rami subteretes et pappus conspicuus, in altera (*T. rivularis*) styli rami supra medium complanati et pappi pili minuti."†

The plant has just the appearance of a small pale Ageratum and the attempt to liken it to Erigeron is an unworthy evasion of the fact.

It has been compared at Harvard with the type of *T. Wrightii* and found to be exactly the same.

Colcosanthus Cass. for *Brickellia* Ell. Although Mr. Greene evidently doubts the sufficiency of the characters separating Brickellia from Kuhnia, he nevertheless supplements Dr. Kuntze by transferring a few additional species. Baillon reduces Brickellia

* Erythea i, 41.

† Genera Plantarum i, 241.

to Eupatorium. Bentham says "Genus Kuhniæ quam maxime affine." Until these questions had been settled we might have been spared the synonymy.

Blepharipappus Hook. Fl. Bor–Am. i, 316, for *Layia* Bot. Beech. 148. Mr. Greene gives the synonymy of this genus, according to his idea, on page 245 of the second volume of Pittonia. He there entirely overlooks the naming of Layia which occurs on page 148 of Botany Beechey, giving reference only to the later page where it is found. It is possible that Blepharipappus is a trifle earlier than Layia, but so far as we now know the fact cannot be established. The volumes were published so nearly at once and quote each from the other in so irregular a manner that the internal evidence leaves the reader in doubt. It is certain that page 142 of Botany Beechey was printed before page 255 of Flor. Bor–Am., for the latter, there quotes from the former. On the other hand it is equally apparent that page 295 of Flor. Bor–Am. was printed before page 146 of Bot. Beechey. On the whole it appears to have been entirely unnecessary for Mr. Greene to transfer the species, even though by so doing his name is made to follow all but one of the new combinations.

Hazardia Greene of a single species amplified to three by the author, did not require the generic name.

Ereminula Greene is substituted for *Dimeresia* Gray, because of previous names, "Dimeria" "Dimesia" "Dimetia" and "Dimeresa." Following such rule, Crockeria might be in danger from the earlier "Krockeria."

Agoseris Raf. for *Troximon* Nutt. The attempt to bring this name into use is an outrage. It occurs on page 58 of Flora Ludoviciana in the concluding sentence of Rafinesque's description of the fictitious *Troximon odoratum* Raf. founded on Robin's '*Chicoracée fenouillette*' and is as follows: "This species together with *Tr. virginicum*, *Tr. pallidum* and *Tr. bulbosum* will form the genus Troximon, the other species which are acaules and with an embricated [l] calyx must form a peculiar genus which I shall call Agoseris." No type species is indicated and no one can be certain of what plants Rafinesque had in that store-

house of vagaries known as his mind. Mr. Greene, however, transfers all the species, attaching his name to every one.

This certainly is not held by reputable naturalists as valid publication of a genus, and Mr. Greene, by failing to reprint the "generic character," lays himself liable to the suspicion of a deliberate attempt to deceive.

Nemoseris Greene for *Rafinesquia* Nuttall, "once a synonym." Rafinesquia is not considered a valid genus by either Bentham & Hooker, or by Baillon.

Ptiloria Raf. for *Stephanomeria* Nutt. Such weak genera as this will hardly bear the strain of a set of synonyms; it is much too near Lygodesmia. Baillon reduces it to Lactuca.

Psilostrophe DC. for *Riddellia* Nutt. This is an older name, apparently, for the same genus. Dr. Kuntze and Mr. Greene have transferred the species independently, and those who append the names of the authors of combinations may have some trouble with their priorities.

The various genera into which Mr. Greene divides Microseris, etc., are not recognized nor are they likely to be.

Bolelia Raf. for *Downingia* Torr. will cause very little trouble either way.

Solanoa Greene for *Schizonotus* Gray which has already been reduced by different authors to neighboring genera.

Clevelandia Greene though very near Orthocarpus was considered a valid genus by Dr. Gray.

Lappula Moench will probably have to be substituted for *Echinospermum* Lehm.

Adenostegia Benth. is of course the older name for *Cordylanthus*.

Audibertia Benth. is reduced to *Salvia* L. with which it is thoroughly confluent; but Mr. Greene, giving an extraordinary description of the corolla of *Audibertia polystachya*, confusing the bud and the flower, makes it the type of a new genus "Ramona."

Lepargyræa Raf. for *Shepherdia* Nutt. Mr. Greene will have to make a better showing for this genus than he does* if he seriously desires the change. He gives sufficient extracts from

*Pitt. ii, 121-122.

Rafinesque to convict the latter either of deliberate falsehood or of eccentricity bordering on madness.

Tumion Raf. for *Torreya* Arn. In order to make this change Mr. Greene would displace Synandra of the Labiates, by an earlier Torreya of Rafinesque, and thus render Arnott's Torreya unavailable for the Coniferous genus.

Razoumofskya Hoff. for *Arceuthobium* Bieb. Let us hope that research may find a less hideous name available for our pine mistletoes.

Unifolium for *Smilacina* Desf. In order to have the pleasure of using this name for our very leafy Smilacinas we are to reduce them to Maianthemum and then take an older name for for that genus. Otto Kuntze would have us adopt Necker's Tovaria. There are certain botanical works which though dealing with systematic botany are usually ignored. Necker's "Elementa" might with very good reason be added to the list. He begins by dividing all known plants into fifty-four "Natural Genera" and groups the genera of other botanists under each "Genus" as species. The only indication as to whether his "species" are original or otherwise is given near the end of the third volume by his index of "Species Naturales Botanicis ignotæ, quibus nomina Neckeriana accommodantur," in the 400 or so names of which there may be found plenty of material for unsettling genera.

The new species proposed by Mr. Greene have, in most cases when critically examined, failed to receive the approval of competent botanists, and they appear to suffer in direct proportion to the examiner's familiarity with the Californian Flora.

Dr. Gray died before Mr. Greene was fairly launched in his species-making and before the collecting of variations had made more than a beginning, nevertheless he, in the supplements to his Synoptical Flora, reduced the following species:

Pentachæta aphantochæta
Pentachæta palcacea
Bigelovia rupestris
Bigelovia tridentata
Lessingia Parryi
Lessingia adenophora
Lessingia nemaclada
Corethrogyne detonsa
Erigeron angustatus
Helianthella Nevadensis
Madia Rammii
Hemizonia Lobbii

Hemizonia hispida
Hemizonia spicata
Hemizonia oppositifolia
Layia graveolens
Blepharizonia laxa
Lasthenia Coulteri
Hymenopappus robustus
Senecio Austinæ
Senecio ammophilus
Senecio Layneæ
Senecio Howellii
Hieracium brevipilum
Nemacladus capillaris
Nemacladus montanus
Nemacladus pinnatifidus
Nemacladus pubescens
Nemacladus tenuissimus
Asclepias pinifolia
Gilia heterodoxa
Krynitzkia Cedrosensis
Krynitzkia cycloptera
Convolvulus fulcratus
Chamæsaracha physaloides
Antirrhinum Kelloggii
Pentstemon Kleei
Pentstemon pauciflorus
Mimulus acutidens
Mimulus barbatus
Mimulus Hallii
Mimulus inodorus
Mimulus microphyllus
Eunanus Breweri
Eunanus Layneæ
Plantago Californica

Prof. C. S. Sargent in his magnificent "Trees of North America," reduces every one of Mr. Greene's species occurring thus far in the work of which four volumes are now published. They are *Rhamnus insularis*, *Rhamnus rubra*, *Ceanothus arboreus* (retained as a variety), *Cerasus Californica*, *Lyonothamnus asplenifolius*, *Amelanchier glabra*, *Amelanchier pallida*. *Ptelea crenulata* is not even mentioned. Besides these all the species revived from synonymy by Mr. Greene are reduced.

Rev. Thomas Morong revising in Bull. Torr. Club xv. the American Typhaceae reduces the species of Mr. Greene, *Typha bracteata* and *Sparganium Californicum*, belonging to that order.

Prof. William Trelease has also reduced the species of Rhamnus, as well as of Epilobium.

C. F. Millspaugh in Pitt. ii, 82-90 considers *Euphorbia Neo-Mexicana* and *E. rugulosa* Greene to be merely varieties of *E. serpyllifolia* Pers.

The species of Astragalus proposed by Mr. Greene have been recently studied from the types, and the notes upon them appear in pages 22—33 preceding.

The descriptions of the species hereinafter enumerated are in most cases to be found either in the series of papers issued by

Mr. Greene under the name of "Pittonia" or in his "Flora Franciscana." The references of the few exceptions are given. No attempt has been made to verify all of the species. To do so would, in many cases, necessitate the partial revision of large genera and the study of priorities, involving an amount of time not now at the disposal of the writer. For these reasons the two score new species and the various genera "instituted" within the limits of the old genus Eritrichium and the numerous species of Delphinium, Trifolium, Potentilla, Erigeron, Cnicus, Senecio, Microseris, etc., are here neglected, as well as many of the of the Cruciferæ. Fortunately for the interests of science the larger number of the types are in the herbarium of the California Academy of Sciences. The later ones are being mounted and rendered accessible in the herbarium of the University of California at Berkeley, and if the notes given under the species seem to bear hardly upon the capacity or the judgment of Professor Greene, the means of proof or disproof are in most cases at hand.

Thalictrum cæsium Greene is apparently *T. polycarpum* Wats., but that species is so near *T. Fendleri* that it is uncertain to which it had better be referred.

Thalictrum hesperium and *C. playtycarpum* Greene are forms of *T. Fendleri* Engelm. Mr. Greene keeps the name up, although he says it "seems almost or quite confluent with *T. Fendleri* of the southern Rocky Mountains."*

Ranunculus Bolanderi† Greene is, according to Dr. Gray, typical *R. alismæfolius* Geyer.

Ranunculus Biolettii Greene is *R. pusillus* var. *Lindheimeri* Engelm. It has been collected by the writer at Folsom, and about ponds near Olema, where it is common, it is often a foot or more in length.

In Flora Franciscana Mr. Greene describes *R. pusillus* Poir, and remarks: "Rare in California, though common in the southern Atlantic States; found in Napa Valley, *Bigelow*, and in Marin Co., *J. P. Moore*. The akenes are either smooth or rough in even the eastern plant, so that the designating of ours

* Fl. Fr., 310.

† Bull. Cal. Acad. ii, 58.

as a variety seems unwarranted." This was published in April, and in the following month he described the species, from plants collected near Bigelow's Station, as *Ranunculus Biolettii.* Dr. Gray, in his last revision, calls the plant *R. pusillus* var. *Lindheimeri.* It is *R. trachyspermus* Engelm, var. *Lindheimeri,* but there was an older *R. trachyspermus.* Dr. Gray implies that *R. Bonariensis* Poir and *R. fontanus* Presl. are too nearly related to it, so also is apparently *R. humilis* H. & A.

*Ranunculus Ludovicianus** Greene is *R. Californicus,* var. *latilobus* Gray. The type was collected by the writer.

Ranunculus maximus † Greene is *R. orthorhynchus* var. *platyphyllus* Gray. It is rather common in Marin County and has been collected by the writer at Ager, near the Klamath River. The extremes of its foliage are much less than are shown between such forms of *R. Californicus* as the prostrate plants with thick, hardly divided leaves, at Point Lobos, and the slender, erect ones with very finely divided foliage, which grow about Castroville.

Ranunculus alismellus Greene is *R. alismæfolius* var. *alismellus* Gray.

Ranunculus rugulosus Greene is evidently a mere form of *R. Californicus* Benth.

Ranunculus ellipticus Greene. In Pitt. ii, 110, this is described as "a widely dispersed and often collected for western species, which has long been wanting specific definition," and shortly after in Flora Franciscana it is reduced to *R. glaberrimus* Gray.

Ranunculus subsagittatus Greene was raised in rank from *R. Arizonicus* var. *subsagittatus* Gray, in Pitt. ii, 59, where he remarks that "*R. Arizonicus* looks a good deal more like the ordinary Rocky Mountain *affinis* than does the preceding." On page 110 following he admits having jumbled the species and reduces his *subsagittatus* in consequence.

Ranunculus Turneri Greene is apparently *R. lasiococcus* Ledeb.

Berberis pumila Greene is *B. repens* Lindl. and the earliest specimen so labeled was from Mt. Hanna in Lake County.

Vancouveria chrysantha Greene is *V. hexandra,* M. & R.

---

* Bull. Cal. Acad. ii, 58.

† Bull. Torr. Club, xiv. 118.

Argemone corymbosa Greene is *A. platyceras* Link & Otto. It was found about a railway station on the Mojave Desert and has been only once collected.

Papaver Lemmoni Greene is *P. Californicum** Gray.

Mr. Greene refers *Meconopsis heterophylla* to Papaver and copies the incorrect reference of Bot. Calif. to the plate number of Hooker's Icones.

Platystigma (*Meconella*) *denticulatum* Greene is *Platystemon Oreganus* (Nutt.)

Dendromecon flexile† Greene is *D. rigidum* var. *Harfordii* (Kell.)

Platystemon crinitus Greene is *P. Californicus* Benth.

Eschscholtzia Austinæ, glyptosperma,‡ *Mexicana,*§ *peninsularis,*‖ *rhombipetala, elegans,*¶ *ramosa,*** Parishii,†† *maritima, modesta, tenuisecta, leptandra, Lemmoni,*‡‡ *ambigua* Greene are unnecessary additions to the synonymy of the genus, all possible species having been already amply provided for in previous synonyms. In Flora Franciscana, perhaps having reason to fear that his *E. glauca* was in danger of being mistaken for a half dozen other species, he provides it with a new and striking character—"Species exceedingly well-marked by a certain not well-definable grace of its very beautiful white-glaucous foliage." The phrase is so inimitable that one regrets to disturb it, but judging by the type specimen the "white-glaucous" part is a mistake.

Nasturtium occidentale Greene is *N. curvisiliqua* (Hook.). The statement that the pods are "flattened contrary to the partition" is misleading, the partition being nearly as broad as the valves.

Nasturtium dictyotum Greene. This exactly matches specimens of *N. sessiliflorum* Nutt. and other specimens current as *N. palustre* DC.

---

* Zoe, ii, 121.

† Bull. Torr. Club, xiii, 216.

‡ Bull. Cal. Acad. i, 70.

§ Bull. Cal. Acad. i, 69.

‖ Bull. Cal. Acad. i, 68.

¶ Bull. Cal. Acad. i, 182.

** Bull Tor. Club xiii, 217.

†† Bull. Cal. Acad. i, 183.

‡‡ W. Am. Sc. 157.

Cardamine cardiophylla Greene as well as the revived synonyms *C. integrifolia* (Nutt.) and *C. Californica* are all apparently forms of the varying *C. paucisecta* Benth. *C. cuneata* Greene known only in immature specimens may belong here also, but the foliage is more dissected. *C. integrifolia* (Nutt.) is apparently the oldest name.

Streptanthus Parryi Greene is *Caulanthus Lemmoni* Wats., the older name.

Streptanthus niger, peramœnus, albidus, barbiger, Biolettii, pulchellus, Mildredæ, and *secundus* Greene are nearly all separated by inconstant characters from *S. glandulosus.* Watson in one of his later papers reduced *peramœnus* and *albidus; pulchellus* and *secundus* are the same thing from the same locality.

Thysanocarpus ramosus * Greene is *T. elegans* F. & M.

Cerastium grande Greene is certainly *C. maximum* Ledeb.

Silene purpurata Greene, by the description, seems to be *S. repens* Ledeb.

Silene simulans Greene is *S. laciniata* Cav.

Alsinella ciliata Greene is *Sagina apetala* L.

Paronychia pusilla Greene is *Herniaria cinerea* L. another waif from the Mediterranean region. A second species *H. glabra* was collected by Mr. Congdon, near Darrah, in Mariposa County, some years ago. Mr. Greene might be forgiven for renaming the obscure weeds which make their advent into California if he would but acquire the knowledge necessary to place them in the proper genera.

Tissa pallida, T. leucantha, T. Talinum† & *T. valida*† Greene are forms of that species of which the oldest name is, apparently, *macrotheca. T. Talinum* and *T. valida* are perfectly inexcusable.

Tissa Clevelandi Greene is *rubra,* the perennial form.

Tissa tenuis Greene is *Lepigonum gracile* Wats. and both are probably referable to *diandra* and perhaps to still older names. The type of *tenuis* was collected at Alameda and Dr. Kellogg collected it at the same place more than ten years earlier. It often has four stamens, and is perhaps never truly apetalous; like *gracile* it has from one to four small, obovate, hyaline petals

* Bull. Cal. Acad. ii, 390.

† Eryth. 106 and 107.

usually entirely obscured by the broad hyaline margin of the sepals. It is very common in sandy places in California and runs into many forms, as diverse in the size of petals and the markings of the seeds as any other species. Bentham & Hooker are probably right in considering the numerous species reducible to three or four, and so far at least as California is concerned all our forms are European, and either introduced or common to maritime shores.

Viola pinetorum Greene, is reduced by the author to *V. purpurea* Kell. It was described as "having truly violet colored petals; all other known species of the group being yellow-flowered." In Flora Franciscana, however, he reduces it without explanation to the yellow-flowered *V. Nuttallii*.

Viola Douglasii Steud. is substituted for *V. chrysantha* Hook. on account of an older homonym; then as Philippi has named another species (from Chili) *V. chrysantha*, Mr. Greene furnishes that also with a new name, *V. Philippiana*. All this without troubling himself in the slightest degree about the validity of the species involved, and apparently without taking the trouble to notice the previous *V. Philippii* Leyb.

Calyptridium (Spraguea) nudum Greene is a condensed subalpine form of *Spraguea umbellata* Torr.

Claytonia nubigena Greene is a common form of *C. perfoliata* Donn.

Sidalcea tenella Greene is *S. Hartwegi* Gray.

Sidalcea secundiflora Greene is a variety of *S. diploscypha* Gray.

Sidalcea campestris Greene is founded on the sterile (male) plants of, apparently, *S. Oregana* Nutt.

The perennial species of Sidalcea are certainly not nearly so numerous as has been supposed. Long suites of specimens from many localities show that the differences relied upon as specific are far from constant. Even the generic type is becoming much weakened by forms in which the double series of anthers is much less evident. It is remarkable that Sidalcea should have been considered beakless when nearly every species is beaked more or less strongly. Mr. Greene, who has probably never seen the

figure in Ic. Mex. Ined.* on which the species was founded, transfers the name *S. malvæflora* (Moç. & Sesse) to what has been of late called *S. Neo-Mexicana* Gray and takes up *S. delphinifolia* Nutt. for the common species of the coast of California. From his remarks he appears to think that the original *S. malvæflora* was glabrous, whereas the drawing shows it to have a copious spreading pubescence.

Erodium Californicum Greene was brought from Santa Cruz Island by Mr. Brandegee in 1888. It seems to be only a rank and vigorous *E. macrophyllum* Hook. & Arn. of which it has the glandular pubescence and exactly the fruit. *E. macrophyllum* has neither the habit nor the distribution of a native.

Ptelea crenulata Greene is *P. angustifolia* Benth.

Ceanothus connivens Greene is a hybrid of *C. cuneatus* & *prostratus.*

Ceanothus rugosus Greene is a hybrid of *C. velutinus* & *prostratus.*

Ceanothus vestitus Greene is one of the forms connecting too closely *C. cuneatus* and *C. Greggii.*

Up to date Mr. Greene is guilty of eighteen "new species" of Lupinus, including *L. adsurgens* & *L. sylvestris*† Drew, for the naming of which he was responsible. Three species he has himself reduced—*L. Franciscanus* Greene to *L. versicolor* Lindl., *L. adsurgens* to *L. latifolius* Agardh. and *L. sylvestris* to *L. albicaulis.* Dougl.

Lupinus umbellatus‡ Greene is *L. micranthus* Dougl.

Lupinus capitatus Greene seems to be *L. Sileri* Wats.

Lupinus pachylobus Greene is *L. bicolor* Lindl.

Lupinus Pondii Greene is a form of *L. Arizonicus* Wats.

Lupinus carnosulus Greene is *L. nanus* Dougl. In the original diagnosis Mr. Greene describes it as "with the habit of large states of *L. nanus* but very distinct, wanting the variegated or changeable petals and villous-edged keel of that species; the herbage fleshy as in *L. affinis.*" An inspection of the type of *L. carnosulus* in the herbarium of the California Academy of

* There are probably only two copies of this work in America, one in the library of the Gray Herbarium, the other in the library of Mr. Brandegee.

† Bull. Torr. Club. xvi, 150

‡ Bull. Cal. Acad. ii, 145.

Sciences shows that the plant is only slightly more fleshy than in typical *nanus*, which may perhaps be accounted for by its vicinity to the coast, that the keel is ciliate and that the upper half of the banner is white, becoming rose-purple in age.

The author's motive for making and reiterating statements of this kind which may be so readily disproved is a psychical problem past finding out.

The forms of *L. microcarpus* Sims approach *L. brevicaulis* Wats. very closely and Mr. Greene has not helped matters by creating *L. malacophyllus* between them.

The perennial Lupines of Mr. Greene are in even worse case. The trouble with them is that they are nearly all intermediates in groups of species already too nearly related, and extensive revisions with consultations of distant types are necessary to determine their true names.

Amorpha hispidula Greene is *A. Californica* Nutt. "The prickle-like glands interspersed among the depressed and sessile" are very common in glandular Leguminosæ. When, as nearly always happens in age, the upper part of the gland breaks away the remaining basal portion is the "depressed and sessile" one.

Hosackia Veatchii Greene, *Syrmatium dendroideum* Greene and *Syrmatium patens* Greene, are forms of *Hosackia glabra*.

Hosackia nivea Wats. is a synonym of *H. argyræa* Greene, but this did not prevent Mr. Greene from making a subsequent *Syrmatium niveum*. This last, however, as well as *S. ornithopus* Greene is too near *H. argophylla* Gray.

Hosackia procumbens Greene is apparently *H. sericea* Benth.

Hosackia Guadalupensis Greene and probably *H. occulta** Greene, described from seedling specimens without flowers or fruit, belong to *H. grandiflora* Benth.

Hosackia macrantha Greene and *Lotus leucophæus* Greene are both *Hosackia grandiflora* var. *anthylloides* Gray. Mr. Greene in the original description of *H. macrantha* discourses concerning the subulate glands—he calls them "foliaceous." They are alike in all the forms of *H. grandiflora* and very nearly so in all

* Bull. Cal. Acad. ii, 394. Mr. Greene in his enumeration of the species in Pitt. ii, 133–150, omits this name, although in the original description it is characterized as "this unquestionably new species."

the gland-stipular species, *i. e.*, the glands when young are subulate, the upper part breaking away later and leaving the more or less thickened base.

Lotus humilis Greene is *Hosackia maritima* Nutt. and *L. tomentellus* Greene probably belongs to the same species.

Hosackia mollis Greene is a form of *H. puberula* Benth.—both too near *H. Wrightii* Gray.

Lotus hirtellus Greene is *H. strigosa* Nutt.

Lotus sulphureus Greene is *Hosackia Heermanni* Dur. & Hilg. The species was described from the Tehachapi Range, and the "San Francisco sand hills" mentioned as a station is probably an error. It is thoroughly confluent with *H. Nevadensis* Greene and it will be sufficiently difficult to keep the form represented by these three names from *H. decumbens* on the one hand and *H. tomentosa* on the other. In correction of his extremely loose nomenclature Mr. Greene will perhaps be glad to learn that there is a *Lotus tomentosus* Rhode, in Schrad. Neue Journ. 1809, p. 42; a *Lotus macranthus*, Lowe, Novit. Flor. Mad. 546; and a *Lotus sulphureus* Boiss., Tchihatch. As. Min. Bot. 1, t. 1.

Cerasus Californica Greene is *Prunus emarginata* Dougl.

The types of Mr. Greene's two species of Rosa, *R. gratissima* & *R. Sonomensis*, have not been seen by the writer, but judging by the published character, even without taking into consideration the author's well-known capacity for finding characters which remain invisible to others, they cannot be maintained.

Neillia capitata Greene is *N. opulifolia* B. & H.

Saxifraga malvacea Greene is *S. Parryi* Gray.

Heuchera maxima Greene is *H. pilosissima* F. & M.

Tellima nudicaulis Greene is *Heuchera Williamsonii* * Eaton.

Ribes Mogollonicum † Greene is *R. Wolfii* Rothrock.

Ribes Marshallii Greene is a large flowered *R. ambiguum* Wats. They are probably both forms of *R. Lobbii* which though found in Lake County has been omitted from Flora Franciscana.

Ribes quercetorum Greene seems hardly separable from *R. leptanthum*.

---

* Bot. Gaz. xv, 62; xvi, 237.

† Bull. Torr. Club viii, 121.

Ribes velutinum Greene is *R. leptanthum* var. *brachyanthum* Gray—the pubescent form.

Ribes amictum & *R. Victoris* Greene are two of the forms which Mr. Greene in addition to *R. Californicum* H. & A. and *R. subvestitum* H. & A. would separate from *R. Menziesii* though he thinks *R. Victoris* possibly identical with *R. occidentale* H. &. A., "a shrub which cannot be identified by the very inadequate diagnosis given in the Botany of Beechey's Voyage." It seems not to have occurred to Mr. Greene that there are other means than these imperfect descriptions of verifying the species of Bentham & Hooker.

Lythrum adsurgens Greene is *L. Hyssopifolia* L.

Lythrum Sanfordi Greene appears to be identical with the Chilian *L. albicaulis* Bert.

Eucharidium Saxeanum Greene is *E. Breweri* Gray. It is rather common on the eastern side of Mount Hamilton.

Zauschneria latifolia, *tomentella*, *villosa* & *cana* Greene are variations of one polymorphous species, the last and most diverse, *Z. cana*, is *Z. Californica* var. *microphylla* Gray. Mr. Greene says "there is every reason for thinking that the plant of the southern part of California, which Dr. Gray had named var. *microphylla* is the typical *Z. Californica.*"* He had evidently never seen Presl's plate which accords very much better with *Z. villosa* Greene.

Œnothera Hilgardi† Greene is *Œ. andina* Nutt.

Œnothera Cedrosensis‡ Greene is *Œ. cardiophylla* Torr.

Œnothera nitida Greene is a more glabrous form of *Œ. cheiranthifolia* Hornem. It is not uncommon mixed with the ordinary form, near the coast from San Francisco southward.

Œnothera crassiuscula Greene is *Œ. angelorum* Wats.

Œnothera hirtella Greene is *Œ. micrantha* Hornem.

Œnothera Jepsoni, *arguta*, & *depressa* Greene are forms separated from *Œ. biennis* by Mr. Greene along with the revived synonyms, *Œ. grandiflora* Ait. and *Œ. Hookeri* T. & G. *Œ. depressa* was described from a cultivated specimen as "pros-

* Pitt. 1, 27.

† Bull. Torr. Club. x, 41.

‡ Bull. Cal. Acad. i, 187.

trate, only the spicate ends assurgent." The plant in Montana from which the seeds were gathered was, however, according to the collector, entirely erect.

Godetia micropetala Greene is *G. quadrivulnera* (Dougl.) with depauperate corolla. Mr. Greene in Flora Franciscana says: "spike rather short," but his type shows it to be nearly a foot long with remote flowers.

G. pulcherrima Greene is what has been known as *G. Bottæ* Spach. Mr. Greene finds it quite different in color from typical *Œ. Bottæ*, but fails to explain how he came by his exact knowledge of the coloring of *Œ. Bottæ*. It is indeed too probable that a part of the southern *Œ. Bottæ* as received, belongs to *Œ. amœna* Lilj. and the remainder to *Œ. biloba* Wats. *Œ. pulcherrima* Greene is very common, ranging from Lake County to San Diego. It is not distinguishable by any character from entire-petaled forms of *Œ. biloba* and shares with it a somewhat inconstant character—the purple or lilac sepals—which is the most striking difference readily observable between forms of *Œ. amœna*, and these others.

Godetia purpurea Wats. of which Mr. Greene writes: "Mr. Watson attributes to this species two rows of seeds in each cell of the capsule. No such plant has been recognized by the present writer," is not uncommon in the Sacramento Valley. Mr. Greene will find it if he looks along the trenches by the side of the railway near Elmira. The character "two rows of seeds in each cell" is probably as inconstant as the pedicel of the *amœna* group. Specimens of what Mr. Greene would probably call *G. rubicunda* collected near Sonoma by John MacLean show two rows in their very large capsules.

Sium heterophyllum Greene is probably not a native species.

Selinum eryngiifolium Greene is a common form of *S. capitellatum* B. & H. with rather more dissected foliage.

*Galium buxifolium** Greene is *G. Catalinense* Gray.

Galium flaccidum Greene is *G. Californicum* F. & M.

Galium Miguelense Greene is *G. Nuttallii* Gray.

Sambucus callicarpa & *S. maritima* Greene=*S. glauca* Nutt. The diagnosis of *S. callicarpa* is a mixture of the charac-

* Bull. Cal. Acad. ii, 150.

ters of *S. glauca* and *S. racemosa*, but is principally of the first, and his type specimens are from trees of *S. glauca*. He says: "The arborescent habit, stipulate and often bipinnate leaves, but more than all the broad and flat rather than thyrsoid inflorescence and fruit-clusters mark this [*S. callicarpa*] as a species very distinct from the Old World *S. racemosa*, in which latter the corolla lobes moreover are closely reflexed against the pedicel. The eastern shrub, *S. pubens*, is easily distinguishable from both by a character not hitherto mentioned, *i. e.*, the large, rounded and very conspicuous winter-buds. The red-berried elder of the northern woods from Oregon to Alaska is not *S. racemosa*, for it has, like our species, very ample and almost flat-topped cymes; but neither am I confident of its identity with *S. callicarpa*. Our tree has small winter-buds and is hardly in flower before April, putting forth its leaves in March."*

Subsequently he redescribes the plant as *S. maritima:* "Though I named as the type of my *S. callicarpa* the beautiful, scarlet-berried elder common in California, and called *S. racemosa* in the State Survey Botany, the description of the trunk, foliage, etc., was drawn from fresh specimens of a tree which now proves by its mature fruit to be a wholly distinct and new species. Said trees, which, by their early flowering and general resemblance to the red-berried species, I had always supposed to be that, had always interested me deeply by their strangely maritime habit. They stand at only a few rods distance from a sand-beach of San Francisco Bay; and that in a depression which cannot more than equal the level of the salt water at less than the highest tide. * * * By its early flowering and other peculiarities, it is clearly of that group which embraces *S. racemosa*, *callicarpa* and *melanocarpa*. That the American *S. pubens* is distinct from *racemosa* I indicated in the Flora Franciscana."†

This remarkable group of *Sambucus glauca* furnishing from the same stem type specimens of two species, both according to the author to be kept up, may be seen along the northern end of Shell Mound. It is not in danger, as one would infer from the author's language, of a bath of salt water. Mr. Greene evidently

---

* Flora Franciscana, 342.

† Pitt. ii, 297.

intends his first name to apply to our red-berried elder, because he mistook the trees for that species, describing them when in flower. Later when he found the fruit glaucous he gave them the second name.

Valeriana rhombifolia Greene is at Harvard credited to *V. scorpioides* DC.

Grindelia Hendersoni Greene is *G. Oregana* Gray.

Grindelia lanata Greene is the more pubescent form of *G. integrifolia* DC.

Grindelia patens Greene is *G. hirsutula* H. & A.

Grindelia rubricaulis DC. Prodr. v. 316, 1836, is taken up by Mr. Greene in place of *G. hirsutula* H. & A. Bot. Beech., 147. It has already been shown on a preceding page that the Californian part—not the supplement—of Botany Beechey, must have been printed simultaneously with the first volume of Hooker's Flora Boreali-Americana, printed in 1833. To adopt the true date of Hooker's Flora, and continue the obviously incorrect one of the early parts of Bot. Beechey admits apparently of the largest amount of changes possible. Mr. Greene's action tacitly infers gross injustice on the part of De Candolle's contemporaries. We shall be driven finally to settle these matters by affidavits from the printers or excerpts from ancient ledgers.

Grindelia patens Greene is *G. hirsutula* H. & A. As Mr. Greene had not access to the types how could he be certain that *G. rubricaulis* and *G. hirsutula* did not represent the two forms into which he would divide the received *G. hirsutula?*

Hazardia detonsa, cana, & *serrata* Greene are all the same species, *Diplostephium canum* Gray.

Helianthella Nevadensis * Greene is *H. Californica* Gray.

Viguiera Parishii † Greene is *V. deltoidea* Gray.

Madia hispida Greene is *M. elegans.* Mr. Greene is in error in his statement that it flowers at a different season.

Chænactis lacera Greene is a pappose variety of *C. artemisiæfolia* Gray.

---

* Bull. Cal. Acad. i, 89.

† Bull. Torr. Club. ix, 15.

Laphamia Peninsularis Greene* is *Perityle Fitchii* Gray.

Senecio Blochmanæ Greene is *S. Douglasii* DC.

Prenanthes stricta Greene is *Luina Piperi* Rob. Mr. Greene's name is the earlier, but it is a curious commentary on his attempt to separate the Cichoriaceæ as a distinct order from the other Compositæ that he should have referred a Senecio to Prenanthes. His latest attempt to settle its relationship is to put it into Cassini's "Psacalium," but as Psacalium is always reduced to Cacalia and Cacalia usually to Senecio he might as well have reduced it to that genus at once.

Malacothrix altissima† Greene seems to be only the inland form of *M. saxatilis* T. & G. A specimen collected on the Santa Lucia mountains and referred by Mr. Greene to *M. altissima* is certainly nothing but *saxatilis*. The type is from Tehachapi, and was collected by the writer.

Malacothrix insularis‡ & *squalida*§ Greene and *M. foliosa* Gray are forms of the same species.

Stephanomeria virgata Benth. *S. paniculata* & *exigua* Nutt. *S. coronaria*|| & *tomentosa*¶ Greene and "*Ptiloria*" *canescens* & *pleurocarpa* Greene, represent at the utmost three species, and they are so difficult to discriminate and so entangled with connecting forms that they may have to be reduced to one.

Lobelia Rothrockii Greene is the variety *serrata* of *Palmerella debilis* Gray.

Downingia concolor,** *humilis*, *insignis*, *montana*, *ornatissima* & *tricolor* Greene are forms of a single polymorphous species. Three or four of them can often be collected in the same "hog-wallow." At Vanden Station, for instance, in the same late-dried depression, the writer collected *D. pulchella*, *D. ornatissima*, *D. concolor* & *D. humilis*.

Howellia limosa Greene is extremely like the terrestrial form of *H. aquatilis* Gray. The chief difference seems to be in the

---

* Bull. Cal. Acad. i, 8.
† Bull. Cal. Acad. i, 195.
‡ Bull. Cal. Acad. i, 194.
§ Bull. Cal. Acad. ii, 152.
|| Bull. Cal. Acad. i, 194.
¶ Bull. Cal. Acad. ii, 152.
** Bull. Cal. Acad. ii, 153.

smaller seeds of *H. limosa*, but those of the terrestrial form of *aquatilis* are hardly known. A form of *limosa* was collected in May, 1892, in a trench by the side of the railway about a mile north of Suisun. The plants formed a matted mass several feet in length, and were fruiting abundantly from extremely minute cleistogamous flowers—no others were to be found. Mr. Greene's station was not far distant. Both the locality and the rarity of this plant show it to be in all probability a recent introduction.

Arctostaphylos insularis,* *patula* & *media* Greene are like nearly all the recent species proposed, mere variations of the older ones of which several are maintained with difficulty.

Rhododendron Sonomense Greene is *R. occidentalis* Gray.

Pholisma depressum Greene † is *P. arenarium* Nutt.

Dodecatheon Clevelandi, *Cusickii*, *cruciatum*, *patulum* and *pauciflorum*, are forms of *D. Meadia* L. If the circumscissile dehiscence of the capsule prevailing in most of the western forms of Dodecatheon be made a specific distinction, it was already named before Mr. Greene began, but it has been shown that this form of dehiscence grades into the ordinary one.‡

Gentiana superba Greene is credited at Harvard to *G. lanceolata* Griseb.

Collomia diversifolia Greene is a stout form of *C. heterophylla*. The type was collected by the writer.

Gilia parvula Greene is *G. viscidula* Gray.

Navarretia microcarpa Greene is *Gilia filicaulis* Torr.

Navarretia prolifera Greene is a large-flowered form of *Gilia divaricata*.

Navarretia nigelliformis Greene is a yellow-flowered form of *Gilia cotulæfolia*. It is common about Antioch and in Lake County, and has been collected at San Luis Obispo by Miss M. M. Miles.

Navarretia subuligera, *leptantha foliacea*, & *hamata* Greene are forms of *Gilia atractyloides*, some of them connecting rather closely with *G. viscidula*.

---

* Bull. Cal. Acad. ii, 494.

† Bull. Cal. Acad. i, 198.

‡ Zoe i, 19.

Leptosiphon rosaceus Greene is the well-known *Gilia androsacea* var. *rosacea* Gray, of the sand hills of San Francisco.

Leptosiphon acicularis Greene is the yellow-flowered form of *Gilia micrantha*. Mr. Greene's reasons as given by himself for neglecting the older names are not very convincing. His free use of the word "invariably" is calculated to alarm any one who knows of the almost infinite variety of forms belonging to *G. androsacea* and *G. micrantha*, for the consequences when Mr. Greene shall have been made acquainted with a score or two of them.

Hesperochiron ciliatus Greene is *H. pumilus*, Porter.

Phacelia scabrella Greene is *P. distans* Benth.

Phacelia Arthuri Greene was identified by Mr. Congdon* with *P. platyloba* Gray.

Phacelia suaveolens Greene. This was described as having "4-seeded capsules," and the author in the note under the specific character says:† "It is another of those species which eliminate the boundaries of subgenera or sections; for it combines the capsule and seed of Euphacelia with the narrow elongated corolla of Microgenetes." By a fruiting fragment kindly placed at the writer's disposal by Mr. Greene it is found to belong to Eutoca. The fragment contained a number of empty capsules, and the four still retaining their seeds held eight, six, three, and two respectively, and examination of the empty capsules showed in the larger ones on each half-placenta the points of attachment of six or eight seeds. The author was therefore probably misled by the depauperate upper capsules. The fragment bore neither leaf nor flower, but the published character with the notes here given make it probable that it is *P. brachyloba* Gray, which was described from Monterey and not known farther north until last year, when it was found in great abundance on Tamalpais beyond the second summit.

Phacelia rugulosa & *P. leucantha* Lemmon in herb., Pitt. i, 175. These are respectively strict synonyms of *P. affinis* & *P. Orcuttiana* Gray, Supp. Syn. Fl. ii, part 1. This is one of the instances which serves to show that there are two sides to the question of

* Zoe ii, 125.
† Pitt. i, 223.

the justice or generosity of publishing herbarium names. Many botanists write names in their herbaria as a reminder to study such specimens in the future as time admits, and it is not at all probable that Mr. Lemmon, who is much more careful in such matters than Mr. Greene, would when he came to study the species have passed over the very accessible descriptions furnished by the Synoptical Flora.

Convolvulus Binghamiæ Greene* is *C. sepium* L. It is common in the tule marshes of the lower Sacramento.

Convolvulus macrostegius† Greene is *C. occidentalis* Gray.

Lycium Hassei Greene is *L. Richii* Gray.

Antirrhinum Kelloggii Greene‡ is *A. strictum* Gray, not *A. Kingii* Watson, as referred in Supp. Syn. Fl. ii, 439. The author corrected his mistake.

Collinsia stricta Greene is evidently *C. tinctoria* Hartw.

Collinsia arvensis Greene is what is usually called *C. sparsiflora* F. & M. In some remarks on *C. Franciscana* in Zoe iii, 369, it was shown to be unsafe to separate forms from the type until the type itself was more fully described. The principal character on which *C. Franciscana* rested was its more numerous seeds, assuming that the typical form had but few. *C. stricta*, however, at least a specimen from Michener & Bioletti, labeled "*Collinsia stricta* Greene, No. 1662 a, South Los Guillicos, March 13, 1892," has twelve ovules.

Russellia retrorsa Greene is *R. sarmentosa* Jacq.

Pentstemon arenarius Greene bears on the collector's label the words, "I think it is a variety of the very variable *Pentstemon deustus.* Prof. Gray."

Pentstemon leucanthus Greene is one of the narrow-leaved forms of *P. azureus* Benth.

Pentstemon Sonomensis & *Davidsonii* Greene are well-known forms of *Pentstemon Menziesii* Hook. The first has been for many years in the herbarium of the California Academy of Sciences, from Mt. St. Helena. Mr. Greene in describing it compared it with the sarmentose *P. corymbosus.* He attempts to

* Bull. Cal. Acad. ii, 417.
† Bull. Cal. Acad. i, 208.
‡ Bull. Torr. Club x, 126.

strengthen the species by remarks concerning differences of climate, but unaccountably omits to mention the fact that the flanks of Mt. St. Helena and of the Coast Range north of San Francisco generally, are notoriously foggy in summer, and therefore not the parched region his language would infer. *Pentstemon Davidsonii* is the Alpine form of the species. It was collected by Dr. Gustav Eisen on high mountains at the head of King's River in 1885; by Mr. H. W. Turner of the United States Geological Survey, at 10,000 feet, in Tuolumne County, July 1888; and by Mr. J. M. Hutchings on Mt. Conness in 1891. These last which are from the typical locality, show that Mr. Greene was either unfortunate in his specimens or careless in his statements.

Diplacus arachnoideus,* *parviflorus* & *grandiflorus* Greene are forms of *Mimulus glutinosus* Wendl.

Mimulus glaucescens,† *arvensis*, *glareosus* & *nasutus*‡ Greene are forms of the polymorphous *M. luteus* L. *M. nasutus* in typical form might be maintained as a good variety if the forms connecting were not so numerous.

Mimulus geniculatus § Greene is *M. floribundus* Dougl.

Castilleia hololeuca Greene was erroneously described as having the calyx "deeply cleft on the upper side, merely lobed on the lower." The type shows it to be about equally cleft, and the species rests only on the slender basis of the pubescence, which is nearer *C. Pringlei* than *C. foliolosa*.

Monardella discolor Greene is *M. villosa* Benth. It is the same as Brandegee's No. 235, of 1882, from the Yakima Region, Northern Transcontinental Survey.

Sphacele fragrans Greene is *S. calycina* var. *Wallacei* Gray.

Salvia Bernardina ‖ Greene is probably, as Gray thought, a hybrid.

Stachys acuminata ¶ Greene was by the author reduced to *S.*

---

* Bull. Cal. Acad. i, 210.
† Bull. Cal. Acad. i, 113.
‡ Bull. Cal. Acad. i, 112.
§ Bull. Cal. Acad. i, 280.
‖ Bull. Cal. Acad. i, 211.
¶ Bull. Cal. Acad. ii, 410.

Californica Benth.—the latter itself considered by Dr. Gray only a form of *S. bullata* Benth.

Chorizanthe Nortoni Greene is a variety of *C. Douglasii* Benth.

Eriogonum grande & *rubescens* Greene are mere variations of *E. nudum* Dougl.

Eriogonum molle Greene described as "not in flower" has since been collected in better specimens and proves to be *E. giganteum* Wats.

Eriogonum robustum Greene* is the form of *E. Lobbii* growing at lower elevation. The type of *E. robustum*, collected by the writer, was found at about 4,500 feet.

Eriogonum elegans Greene is one of the forms of either *E. gracile* Benth. or *E. Baileyi* Wats. *E. Baileyi* as everyone knows was formerly termed "*E. gracile* var. *effusum*," and there are numerous forms now known which can be referred equally well to either. Mr. Greene's reason for comparing it to the suffrutescent *E. saxatile* cannot be conjectured.

Eriogonum agninum Greene judging from the imperfect character is *E. gracile* var. *leucocladon* (*E. leucocladon* Benth.).

Eriogonum Davidsonii Greene Pitt. ii, 295 was reduced by the author in "Errata" a few pages further on in the line "*Eriogonum Davidsonii*=*E. molestum* Wats."

Eriogonum taxifolium Greene has by other botanists always been considered a form of *E. Wrightii* Torr.

Pterostegia galioides† Greene is *P. macroptera* Benth.

Pterostegia fruticosa† Greene (*Harfordia fruticosa*,‡ Greene & Parry) is apparently only an insular variety of the same.

Atriplex dilatata Greene is *A. Barclayana* (Benth.)

Atriplex nodosa Greene is *A. expansa* Wats. It was described from a single old and fragmentary specimen collected by the writer. *A. expansa* often shows two strikingly different forms of fruit in the same plant.

Amarantus carneus Greene is probably an introduced weed. It may be *A. polygonoides* L., though from the very imperfect

---

* Bull. Cal. Acad. i, 126.

† Bull. Cal. Acad. i, 212–13.

‡ Proc. Dav. Acad. v, 26.

description one cannot be certain even that it belongs to Amarantus.

Euphorbia Benedicta Greene is *E. misera* Benth.

Euphorbia velutina * Greene is *E. tomentulosa* Wats.

E. Parishii† Greene, described as "suffrutescent" and as having "the aspect of *E. polycarpa*, but the peculiar flowers of that very dissimilar species, *E. ocellata*, which is annual, with much larger, veiny leaves and round oval seeds," has in the typical specimen no root. Mr. Parish, who collected it, writes: "My own specimen is reduced by repeated division to a mere fragment but the root remains and is plainly annual."

In "West American Oaks" Mr. Greene by the information gained in one hasty trip, made at such a season of the year as to furnish him neither flowers not mature fruit, reached conclusions the opposite of those held by Engelmann, which were the result of several seasons of field study and of a great mass of material from all parts of the country sent in answer to his call. Further study by botanists without the mania for new species which characterizes Mr. Greene is much more apt to reduce than increase the number recognized by Engelmann.

The white oak of the southern part of California was considered by Engelmann to belong to *Q. oblongifolia.* Mr. Greene separates it as a species, under the name *Q. Engelmanni* Greene.

As Mr. Greene's figures sufficiently show, *Quercus Douglasii* H. & A. as it goes south runs into forms which are differently placed by botanists either in *Q. Douglasii* or in *Q. oblongifolia* (*Q. Engelmanni*), and the first duty of an investigator of our oaks is to show that they are not northern and southern forms of the same species. In a climate like that of California the question of deciduous or persistent leaves makes very little showing in the matter.

Quercus McDonaldi Greene if separable from *Q. oblongifolia* cannot be held distinct from forms of *Q. undulata* Torr. such for instance as the one taken up by Mr. Greene under the name *Quercus venustula.*

Quercus McDonaldi var. *elegantula* Greene was admitted by

* Bull. Cal. Acad. ii, 57.
† Bull. Cal. Acad. ii, 56.

the author to be a hybrid between *Q. Engelmanni* & *Q. dumosa.* In this he may or may not be correct. There are large trees of the same form near Escondido, San Diego County.

Quercus turbinata Greene is of course a form of *Q. pungens* Liebm., itself considered by Dr. Engelmann only a variety of *Q. undulata.* The drawing represents either an extreme, unusual form, or the proportion between the acorn and the cup is not correctly shown. The specimens in the herbarium of the California Academy of Sciences collected at the same time and place by Mr. Dunn have longer cups and acorns one-fourth shorter.

Quercus parvula Greene is *Q. Wislizeni DC.*

Quercus Gilberti Greene founded inexcusably on a sterile branch has been since investigated by a botanist resident in the vicinity and found to be *Q. Garryana* Dougl. as is also of course *Q. Jacobi* R. Br. which Mr. Greene would revive.

Quercus dumosa var. *polycarpa* Greene was admitted by the author to be only an abnormal form.

In a previous notice* of the West American Oaks it has already been shown how in attempting to re-establish *Quercus vaccinifolia* Kell. Mr. Greene falsified the record perhaps inadvertently, and described the shrub as "very leafy and its small entire leaves, these and its young branches being wholly destitute of the fulvous lepidote pubescence of *Q. chrysolepis,*"† though the original description‡ and painting of Dr. Kellogg were perfectly familiar to him.

Allium dichlamydeum Greene is *A. serratum* Wats. Mr. Greene failed to describe the bulb-coats for some reason, though it could not have been for lack of material, as it grows abundantly in San Francisco where he collected it. The reticulation is much more exactly typical than that of the form found in the interior.

The two species of Muilla proposed by Mr. Greene *M. transmontana* and *M. coronata* differ from *M. maritima* only in their

---

* Zoe i, 156–9.

† West American Oaks, 45.

‡ Proc. Cal. Acad. i, 96, (p. 106, 2nd edition). "Leaves annual, coriaceous, small, oblong-ovate, acute, sub-mucronate, somewhat obtuse at base; glabrous above, reticulate; fuscous and stellate-pubescent beneath."

filaments. In the Botany of California these are described as filiform, which is probably never the case—they are thickened toward the base and more or less deltoid-dilated in all the forms found about the Bay of San Francisco. While it is possible that one of Mr. Greene's species may be maintained it is much more to be suspected that these forms, alike almost to the minutest particular in all other respects, will prove to be filament variations of the original.

*Bloomeria montana** Greene is *B. aurea* Kell.

Brevoortia venusta Greene, according to Mr. Carl Purdy who discovered it, is a hybrid between *Brevoortia Ida-Maia* and *Brodiæa congesta.*

Brodiæa insularis† Greene is *B. capitata* Benth.

Triteleia candida‡ Greene is a not uncommon white form of *Brodiæa laxa.*

Triteleia lugens§ Greene is a form of *Brodiæa ixioides* with the appendages to the filaments shorter than usual.

Triteleia lilacina|| Greene, known only in a single imperfect specimen collected by the writer, was not well described. It differs from typical *Brodiæa lactea* only in the filaments above the membranous expansion adnate to the tube. In *T. lilacina* the membranous margin is nearly obsolete in the free part, while in the ordinary form it is continued in triangular form nearly to the top of the filament. Some specimens just received from Mrs. M. E. P. McCowen, of Ukiah, are exactly intermediate between typical *lactea* and *lilacina.*

Hookera leptandra Greene, from the description, is a form of *B. grandiflora.*

Hookera rosea¶ & *Orcuttii*¶ Greene as well as several species by other recent authors, will certainly be found untenable. They are all founded on the presence or absence of staminodia, appendages to the filament, or slight variations in their length. It seems even to be the opinion of some that the shape of the staminodia, more or less notched as they approach the anther form, entire or acuminate as they recede, is sufficient warrant for the separation of species.

---

* Bull. Cal. Acad. i, 281.
‡ Bull. Cal. Acad. ii, 139.
|| Bull. Cal. Acad. ii, 143.
† Bull. Cal. Acad. ii, 134.
§ Bull. Cal. Acad. ii, 142.
¶ Bull. Cal. Acad. ii, 137-8.

Mr. Orcutt, who however regards "*Hookera Orcuttii*" as a valid species, has made some observations on the staminodia of *Brodiæa minor* that are of interest. He says: "In examining a large number of the flowers of *Hookera minor*, Britten, in the field this spring, I was somewhat surprised to find numerous specimens in which the staminodia were changed to perfect fertile stamens. The first instance noticed was in a flower evidently injured by some insect, but so many examples were found later, where the staminodia were partially or wholly changed into anther-bearing stamens, that I cannot ascribe it to the work of insects. This illustrates how little value can be placed in this genus on the unreliable characters of the stamens and staminodia."*

The characters upon which Mr. Greene would separate his "*Unifolium liliaceum*" from *Smilacina stellata* Desf. or *S. sessilifolia* Wats., it is difficult to say from which for they are not easily kept apart, are not at all constant. They vary much in different climates and exposures, as Mr. Greene in effect admits when at Lake Pend d'Oreille "where in deep shades of fir and arbor vitæ one meets with plenty of *U. sessilifolium;* and here too outside of and above the wet woods, on open ground and in dry soil, grows the unmistakable *U. stellatum*."† Miss Eastwood has carefully observed *Smilacina stellata* as it occurs in Colorado, and finds the grown but unripe fruit dark green with darker bands; the ripe fruit clear bright red. The distichous zigzag stem and plicate leaves are not constant in any of the forms.

Zygadenus porrifolius Greene ‡ is *Z. elegans* Pursh. Mr. Greene says "none of the segments are unguiculate or much contracted at base," but the type shows that the inner segments are abruptly contracted into a broad claw.

Calochortus amœnus Greene, although compared by the author with the yellow-flowered and much more distant *C. pulchellus*, can hardly be considered more than a rose-colored variety of *C. albus*. The color is not uncommon in typical *C. albus*, but the gland is lower and its scales crisped with shorter hairs.

---

* West. Am. Scientist vi, 63.

† Pitt. ii, 33.

‡ Bull. Torr. Club. viii, 123.

Calochortus Plummeræ Greene is evidently *C. Weedii* var. *purpurascens* Watson.

Calochortus excavatus Greene is a form of *C. Nuttallii* T. & G. which is rather common in Nevada.

Calochortus invenustus Greene has not been accessible to me. It may be *C. flexuosus* or *C. Palmeri*, both of which have been found not very far away. It might be well for Mr. Greene, before making any more species on such grounds, to read with care some recent observations by S. B. Parish on the variation not only of the markings but of the gland.*

If *Tradescantia tuberosa*† Greene were a good species it would yet have, under the rule by which the author changed *Horkelia parviflora* Lehm. to *Potentilla Andersoni*‡ Greene, to suffer eclipse on account of the previous *T. tuberosa* Roxb.

Sagittaria Sanfordi Greene collected first in the sloughs about the city of Stockton and since that time on the margins of pools along the county road between Lathrop and Banta was so imperfectly described by the author that even the section to which it belonged could not be made out. It proves to belong to the second division of the genus as formulated by Micheli. The pedicels of the female flowers are much thickened (the flowers are white), and the lamina of the leaf often considerably expanded. It has not the appearance nor the distribution of an indigenous plant, but has not so far been identified with any foreign one.

Juncus uncialis Greene has been collected by the writer at various places, including the locality at which the type was found. It is certainly *J. triformis* var. *uniflorus* Engelm. (*J. segetalis* Engelm.). The seeds in our specimens are faintly ribbed and cross-lined. The author will find that the degree of maturity of the seeds has much to do with the distinctness of their markings.

Cupressus Arizonica§ Greene is not usually considered distinct from *C. Guadalupensis* Watson.

---

* Zoe iii, 352–4.

† Botanical Gazette vi, 185.

‡ Pitt. i, 104.

§ Bull. Torr. Club ix, 64.

A NEW SUBSPECIES OF CEROPLASTES FROM MEXICO.

BY T. D. A. COCKERELL.

In Zoe, Vol. iii, Oct. 1892, Prof. C. H. Tyler Townsend describes, without naming, a Ceroplastes found by Dr. A. Dugès at Guanajuato, Mexico, on Bignonia and Chrysanthemum. Prof. Townsend has now kindly sent me two examples of this Ceroplastes, with the suggestion that if new, the species might be called *C. cistudiformis*. I have adopted this name, while regarding the insect as hardly a distinct species, but rather a subspecies of *C. psidii*, Chavannes, 1848.

CEROPLASTES PSIDII CISTUDIFORMIS, subsp. nov.

Scale: (largest specimen) length 7¼ mm., breadth 6 mm., alt. 4¼ mm. Color pale grey, with a slightly pink tinge at sides. Each cereous plate with numerous radiating fine blackish lines, and the lateral plates with two not very well-defined concentric lines. Below the nucleus of each lateral and terminal plate, the margin is broadly yellowish-white, without marks; these broadly triangular yellowish-white portions are separated above from the rest of the scale by black bands, which become evanescent towards the nuclei of the plates. The central plate has stronger radiating lines or bands at intervals, giving it the superficial appearance of being divided into several, as is the case in *C. janeirensis* and *psidii*.

The plate-nuclei are small, blackish, with the usual white secretion in the centre. That of the dorsal or central plate is rather large. Inside of the (cereous) scale pale ochreous, the divisions between the plates marked with purplish-brown.

Dorsal plate approximately circular, its posterior half strongly gibbous in both the specimens.

Anterior end with a single plate resembling the adjacent lateral. Each side with two approximately square lateral plates.

Posterior end with a very large broad compound plate, with two distinct nuclei, and an obscure third one between them.

One of the specimens contained the desiccated body of the ♀. The skin (corresponding to the "scale" of a *Lecanium*) is yellow

by transmitted light, with many scattered black (as they appear) gland-dots.

Adult ♀, placed in caustic soda, appears crimson, and stains the liquid.

The legs are very small, red-brown. Tibia about one quarter longer than tarsus. Femur about one-third longer than tibia. Tarsal knobbed hairs well-developed. The claw appears as if bulbous at the tip, but this is certainly due to the large bulbous digitules, as in *psidii*.

Compared with the figure of *C. psidii* given by Signoret, the present subspecies seems very different; but when we come to compare the characters in detail, it is apparent that the differences are those of degree rather than of kind, so that it is hard to accord to the Mexican form more than subspecific rank. *C. psidii* was found at Rio Janeiro, and is probably not to be separated as a species from *C. janeirensis*, Gray, 1828.

The present insect belongs to a group of Ceroplastes which is characteristic of the neotropical region, and includes the following species: *C. jamaicensis*, White (Jamaica); *C. cirripediformis*, Comst. (Jamaica, Florida); *C. denudatus*, Ckll., n. sp. (Antigua); *C. depressus*, Ckll., n. sp. (Jamaica); *C. janeirensis*, Gray (Brazil); *C. plumbaginis*, Ckll., n. sp. (Antigua); *C. psidii*, Chav. (Brazil); and perhaps *C. chilensis*, Gray. The three new species mentioned will be described elsewhere.

INSTITUTE OF JAMAICA, March 7, 1893.

RECENT LITERATURE.

E. STRASBURGER: Histologische Beitrage, Heft. iv. *Ueber das Verhalten des Pollens und die Befruchtungs—vorgäuge bei den Gymnospermen. Schwärmsporen, Gameten, pflanzliche Spermatozoiden, und das Wesen der Befruchtung*.—Jena, 1892.

As new facts are brought to light we are constantly obliged to alter our views. Nowhere is this truer than in regard to the structure and functions of the plant-cell. With the marvelous advances made in histological methods, more and more accurate information concerning the minutest details of cell-structure is being brought forward, and this frequently involves material changes in statements hitherto unchallenged.

The extremely interesting and valuable work before us illustrates this most strikingly. Probably no living botanist has contributed so much to our knowledge of the plant-cell as Strasburger, and any statements that come from him on this subject bear the stamp of authority; yet in the present work he has found it necessary to modify very substantially some of his earlier published statements. The work was evidently inspired largely by the recent remarkable discoveries of Guignard, and to some extent also by important researches by Belajeff.

The volume before us is divided into two parts; the first deals with the development of the pollen and the process of fertilization in Gymnosperms; the second, with a comparative study of the zoospores of algæ and spermatozoids, and studies in fertilization in various groups of plants.

Until very recently it was supposed that in the Gymnosperms, with the exception of the Cycads, that but two cells were formed in the ripe pollen-spore, and that the nucleus of the larger one which forms the pollen-tube, was the direct agent in fertilization. Belajeff* demonstrated that in *Taxus* it was the smaller cell that represented the fertilizing element, and Strasburger now finds that this is true also in other Gymnosperms. He also finds that in a number of forms examined, e. g., *Larix*, *Picea*, *Pinus*, *Ginkgo*, that three cells are successively cut off from the body of

*"Zur Lehre von den Pollenschlauchen der Gymnospermen." Ber. der Deutschen botanischen Gesellschaft—1891—Bd. ix, p. 280.

the spore, but that of these three usually but one persists, the first two formed being disorganized soon after they are cut off, so that in the ripe spore but one of these is to be readily seen. This small cell he considers homologous with the antheridium of the heterosporus Pteridophytes. This antheridial cell often divides into two, a small stalk-cell, and a larger one which represents the real generative part. He found that wherever this antheridial body was pluricellular, that it was always formed before the dehiscence of the sporangium.

As the pollen-tube grows, the generative cell of the antheridium becomes detached and passes down the pollen-tube, where it divides into two cells which must be regarded as homologous with the sperm-cells of the lower archegoniates. In the Cupressineæ both cells are functional, and thus two archegonia may be fertilized by a single pollen-tube; in the Abietineæ, however, only one of the two sperm-cells appears to be functional. In the meantime the nucleus of the pollen-tube has also divided, but these nuclei take no apparent part in the process of fertilization, contrary to the earlier views of Strasburger and others. Fertilization is effected by the discharge of the contents of the generative cell through the end of the pollen-tube into the archegonium.

From a study of the three genera of the Gnetaceæ—*Gnetum*, *Ephedra*, and *Welwitschia*, our author concludes that they represent the end members of three separate lines of development within the Gnetaceæ, which together with the other Gymnosperms have had a common origin lower down in the system.

After a careful study of the alleged differences in the male and female nuclei with reference to different stains, he comes to the conclusion that this difference depends entirely upon the amount of cytoplasm taken up by the nucleus for its nourishment. In all cases he claims that the nuclein itself is "kyanophil"—that is, has a special avidity for blue stains, when compared with the cytoplasm; in all cases during nuclear-division the nuclear-segments are distinctly kyanophil. He therefore concludes that when the female nucleus is erythrophil it is due to the presence in it of unassimilated cytoplasm.

The second part of the work deals with the formation and structure of zoospores and spermatozoids, and the process of fertil-

ization. The opening pages review Guignard's discovery of the "attraction spheres" and "centrosomes," structures long known in animal cells, but not hitherto certainly demonstrated in those of plants. These Strasburger regards as essential constituents of the cell, and therefore assumes that they must take part in fertilization, which can no longer be regarded as consisting in the union of the sexual nuclei alone.

Before passing to the consideration of the zoospores the author describes for the first time the occurrence of the attraction spheres in an alga—*Sphacelaria scoparia*—in which he found these easily demonstrable, and concludes as they have been found in so many widely diverse forms, that they are probably always present when there is a separation of the protoplasm into cytoplasm and nucleus. For the protoplasm radiating from the centrosomes, and that composing the spindle-fibres and connecting threads of the karyokinetic figures, he proposes the name "kinoplasm," and supposes it to play an important part in nuclear division.

The development of the zoospores was carefully studied in a number of algæ belonging to different groups. The most important conclusions reached were that the transparent end of the zoospore is composed of kinoplasm that gives rise to the cilia which are formed as outgrowths from it. The envelope in which the zoospores are often contained when first ejected from the mother-cell, is the outer protoplasmic layer (*Hautschicht*) of the mother-cell, and not part of the cell-wall as hitherto supposed.

Comparing the development of the non-sexual zoospores with that of the gametes or sexual ones, and also of the spermatozoids of higher cryptogams, he points out clearly the common nature of all these forms. In *Chara fragilis*, according to his account, the forward, cilia-bearing coils of the spermatozoid, originate as a cytoplasmic appendage of the nucleus, and the hinder coil is also of cytoplasmic origin, and corresponds to the hinder granular part of a zoospore. Only the middle coil is composed of nuclear substance, instead of the whole body of the spermatozoid as has been supposed. The forward coil gives rise to the cilia in the same way as the clear forward end of a zoospore does, and like that he considers this to be composed of kinoplasm. In mosses and ferns, only the small forward coils of the spermato-

zoid are cytoplasmic, while the whole of the large posterior coils is nuclear. The vesicle always attached to these is supposed to be homologous with the posterior part of the body of the spermatozoid of *Chara*, or the granular hinder part of the body of a zoospore.

While he was unable to demonstrate it, he considers it extremely probable that the kinoplasm of the forward part of the spermatozoid contains the centrosomes which are thus transferred to the egg.

In regard to the part which each element plays in the act of fertilization, Strasburger comes to the conclusion that, as Weismann believes, the nuclei are the direct agents of hereditary transmission. As to the centrospheres and kinoplasm, the former are supposed by our author to represent "the kinetic centres from which the impulses for nuclear division, and to a certain extent for cell-division, proceed." The kinoplasm "we consider as the conducting substance for the impulses that radiate from nucleus and centrospheres, and represents the specific motile element in the protoplasm." With each cell-division this kinoplasm is supposed also to divide.

The name proposed by Sachs, "Energid," is adopted for that unit composed of nucleus, centrospheres, and kinoplasm.

He is inclined to give up the view that in the resting nucleus the segments are separated, and to adopt his earlier view that they anastomose so as to form a net-work with no free ends. As an argument against the autonomy of the segments in the resting nucleus, the sudden change in their number which sometimes occurs is cited.

The conclusion finally reached is that the essence of fertilization consists of the introduction into the "entwicklungsfähig" egg of the active "energid" through which the rapid division of the egg is inaugurated.

DOUGLAS H. CAMPBELL.

PROCEEDINGS OF SOCIETIES.

CALIFORNIA ACADEMY OF SCIENCES. *February 6, 1893.* President Harkness in the chair.

Additions to the museum were reported from N. A. Freeman, G. C. Duncan, J. Anderson, John Hemsley, H. N. Cook, J. Z. Davis, Rev. F. H. Wales, C. P. Nettleton, J. H. Cluff, James E. Fowler, T. K. Couperus.

The Librarian reported 225 additions to the library.

Mr. W. L. Watts read a paper on "Natural Gas in the San Joaquin Valley."

Mr. W. S. Chapman called attention to the fact that a bill had been introduced in Congress to contract the limits of the Yosemite Park Reservation, and moved that a committee be appointed to prepare resolutions requesting the Senators and Members of Congress from this State to use their utmost endeavors to preserve the present limits of the Reservation. Messrs. Chapman, Eisen, Hittell, and McDonald were appointed.

Dr. Eisen read a paper on "The Preservation of Game in the Sierra Nevada."

March 6, 1893. President Harkness in the chair.

Additions to the museum were reported from W. H. Shockley, Mrs. E. L. G. Steele, W. L. Watts, Miss Anna Hewston, J. M. Hahn, C. E. Manning, D. T. Hughes, Captain Praetz, Charles A. Keeler.

The Librarian reported 234 additions to the library.

A vote of thanks was tendered to Mr. D. T. Hughes for his valuable donation of a collection of butterflies from Columbia.

Mr. George H. Ashley read a paper on "An Illustration of the Flexure of Rock."

Dr. H. H. Behr read a paper on "The Relations Between Butterflies and Plants."

Mr. Walter E. Bryant read a paper descriptive of new mammals from Lower California, with exhibition of specimens.

April 3, 1893. President Harkness in the chair.

Dr. J. C. Branner, Prof. J. P. Smith, Mr. Marsden Manson, and Prof. W. R. Dudley, were elected to resident membership.

Additions to the museum were reported from Mr. Stone, William H. Shockley, Walter E. Bryant, E. F. Lorquin.

Two hundred and forty-five additions to the library were reported.

Mr. W. L. Watts read a paper on "Subterranean Air Currents in the Sacramento Valley."

Mr. Walter E. Bryant read a paper on "Notes on the Food of Birds."

Dr. Gustav Eisen made some remarks on a dwarf Chinese lily and spoke on the dwarfing of plants in general.

CALIFORNIA BOTANICAL CLUB. *March 4, 1893.* Miss Manning in the chair.

The following were elected to membership: Prof. Moses Craig, Miss May Belle Church, Miss M. E. B. Norton, Miss Alice Mills, W. Vortriede, H. F. Meier, A. C. Zeig, Miss H. A. Spaulding.

The following were elected officers for the ensuing year:

President—Prof. W. R. Dudley.

Vice-President—S. B. Parish.

Secretary—Frank H. Vaslit.

Treasurer—Miss A. M. Manning.

Librarian—Mrs. K. Brandegee.

Curator—Miss E. G. Britton.

Councilors—Mrs. C. E. Miller, Miss S. W. Scruggs, Miss E. J. Arnold.

The annual report of the Treasurer was read showing $57.25 on hand.

CALIFORNIA ZOOLOGICAL CLUB. *February 3, 1893.* Vice-President, Walter E. Bryant, in the chair.

Officers for the ensuing year were elected as follows:

President—Dr. J. G. Cooper.

Vice-President—Dr. Gustav Eisen.

Secretary—Miss E. A. McIllriach.

Treasurer—T. S. Brandegee.

Curator—E. C. Van Dyke.

Councilors—Miss Emily I. Wade, W. W. Price, Miss Lillie J. Martin, Charles Fuchs.

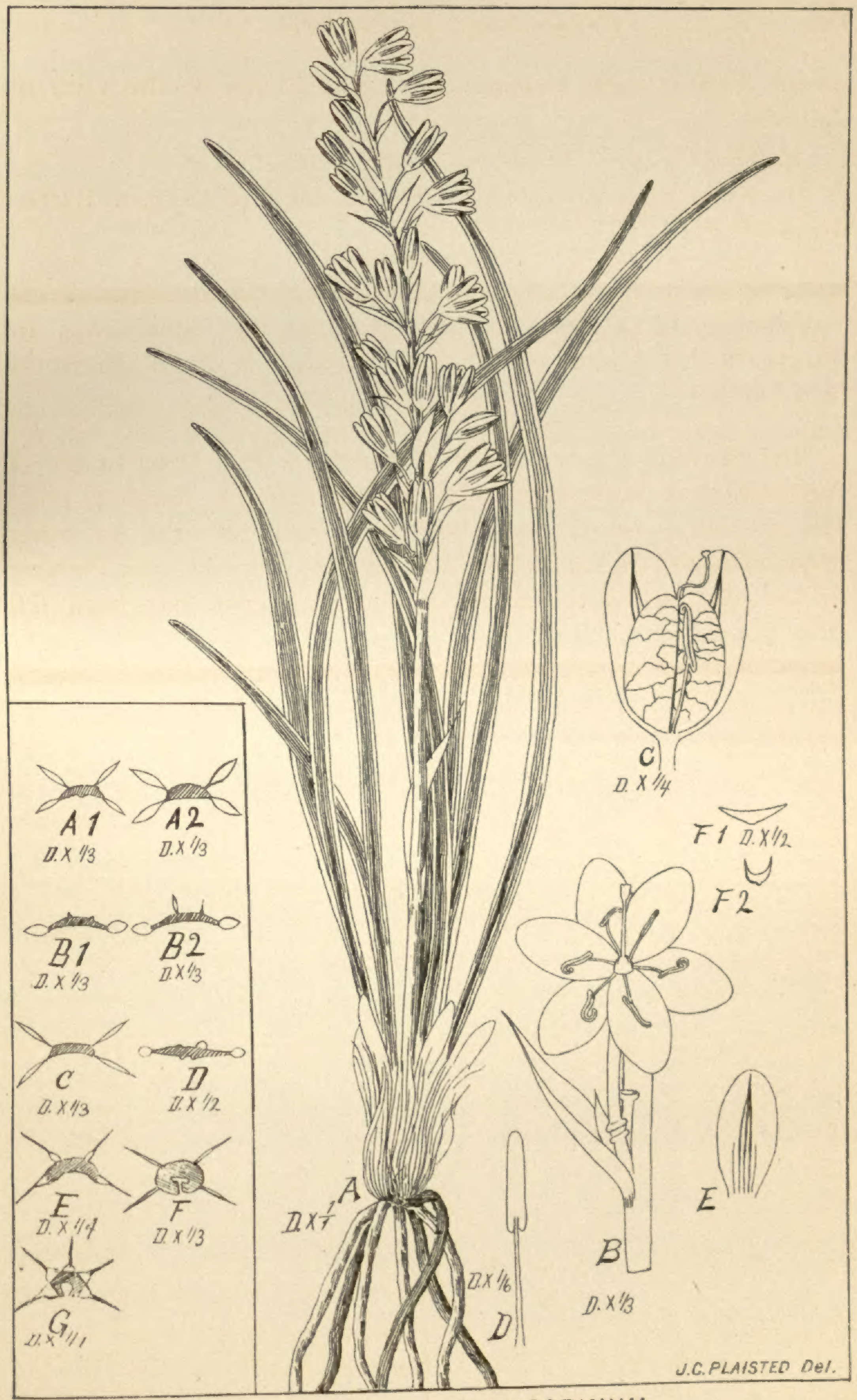
Dr. Cooper read a paper on "The Shells of the Gulf of California."

March 31, 1893. President Cooper in the chair.

Dr. Eisen read a paper on "The Anatomy of Certain Earthworms."

Alphonse de Candolle died on the fourth day April, 1893, in the eighty-seventh year of his age. The whole botanical world feels his loss.

Dr. George Vasey, Chief Botanist of the Department of Agriculture at Washington, died at his home on March 4, 1893. His specialty was Grasses, but he contributed also to other departments of Botany. For twenty-one years he was Curator of the National Herbarium and his influence has been felt throughout the whole country.



CYMOPTERUS.

EREMOCRINUM.

THE HOPKINS SEASIDE LABORATORY.

Scientific and Medical Books and Minerals

LARGEST STOCK IN THE WORLD

SPECIAL CATALOGUES on any branch of Zoology and all Scientific and Medical subjects sent on application.

Collections of Minerals

—FOR—

Students and Others

—AT—

—$1.00 EACH—

and upwards.

Choice Specimens of all Minerals for Colleges, Museums and Private Collectors.

☞Our 128-page illustrated Catalogue of Minerals, 9th edition, now ready.

A. E. FOOTE, M. D., 4116 Elm Ave., Philadelphia

CHARLES C. RIEDY

—DEALER IN—

MICROSCOPES, OBJECTIVES AND ACCESSORIES

All Kinds of Microscopical and Biological Supplies on hand or furnished to order.

432 MONTGOMERY ST., - - SAN FRANCISCO, CAL.